

GDC 073R118-000  
Issue 4, August 1997

Installation and Operation

# DataComm 730-D1/D2

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## Warning

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to CISPR 22, which is designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. The user is cautioned that any changes or modifications not expressly approved by General DataComm void the user's authority to operate the equipment.

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# Errata Sheet for

## Installation and Operation 730-D1/D2

### Publication 073R118-000, Issue 4

#### Overview

This publication reflects changes to the Installation and Operation for 730-D1/D2.

**Preface** - Replace or add Canadian Warning to read:

#### Industry Canada Notification

The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operation and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Notice: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

#### Electromagnetic Compatibility

This Class A digital apparatus complies with Canadian ICES-003.

#### Avis D'industrie Canada

L'étiquette d'Industrie Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme aux normes de protection, d'exploitation et de sécurité des réseaux de télécommunications, comme le prescrivent les documents concernant les exigences techniques relatives au matériel terminal. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il

est possible que la conformité aux conditions énoncées ci-dessus n'empêche pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être coordonnées par un représentant désigné par le fournisseur. L'entreprise de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

**Avertissement:** L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

**Avis:** L'indice d'équivalence de la sonnerie (IES) assigné à chaque dispositif terminal indique le nombre maximal de terminaux qui peuvent être raccordés à une interface. La terminaison d'une interface téléphonique peut consister en une combinaison de quelques dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas 5.

### **La Compatibilité d'Électro-magnétique**

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

### **Service Support and Training**

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#### **International Calling Code (+)**

When calling from outside the country of origin, use the appropriate International Calling Code where the + symbol is shown.

**July 1998**

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## Scope

This manual describes how to install and configure a General DataComm 730-D1/D2. It explains how to monitor and manage this device. It is written for operators and installers and assumes a working knowledge of data communications.

## Organization

This manual has five chapters and two appendices. The information is arranged as follows:

- *Chapter 1 - System Description* introduces important concepts and features of the DataComm 730-D1/D2.
- *Chapter 2 - Installation* tells you how to install the unit. Only typical or fundamental applications are given because of the variety of specific customer system choices.
- *Chapter 3 - Operation* describes the front panels, and the use of the managed options.
- *Chapter 4 - Tests* describes front panel tests and the managed tests.
- *Chapter 5 - Application Guide* describes typical configurations.
- *APPENDIX A* describes the technical characteristics of the unit.
- *APPENDIX B* describes the connector pin-outs.
- *INDEX* contains the DataComm 730-D1/D2 subject and page number.

## Document Conventions

**Level 1** paragraph headers introduce major topics.

**Level 2** paragraph headers introduce subsections of major topics.

**Level 3** paragraph headers introduce subsections of secondary topics screen .



*Notes present special instructions, helpful hints or general rules..*

## Related Publications

The following documents have additional information that may be helpful when using this product:

- *Operating and Installation Instructions for  
DataComm Shelf* GDC 010R310-000
- *Operating and Installation Instructions for  
Universal System Shelf* GDC 010R380-000

GDC publication numbers (e.g., *GDC 073R118-000*) are used to track and order technical manuals. Publication numbers use the following format:

### **GDC NNNRnnn-000** or **GDC NNNRnnn-Vnnn**

- NNN identifies the product family (e.g. DataComm)
- R denotes a technical publication
- nnn a number assigned by Technical Publications
- 000 identifies a hardware product and does not change
- Vnnn the software version associated with a product may be updated periodically

The Issue Number on the title page only changes when a hardware manual is revised or when a manual is reprinted for some other reason; it does not automatically change when the software is updated. A new Software Version is always Issue 1. Other specialized publications such as Release Notes or Addenda may be available depending on the product.

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- *outside the U.S. dial* **1-203-598-7526**

Be ready with the site name and phone number and a description of the problem and the next available support representative will promptly return your call.

Hands-on training courses are provided by GDSC Educational Services. Courses range from basic data communications, modems and multiplexers, to complex network and ATM systems and are taught in Connecticut or at a customer location. Call 1-800-242-1030 and follow the menu instructions to discuss educational services or to receive a course schedule.

## Safety Instructions

### Antistatic Precautions

Electrostatic discharge (ESD) results from the buildup of static electricity and can cause computer components to fail. Electrostatic discharge occurs when a person whose body contains a static buildup touches a computer component.

The equipment may contain static-sensitive devices that are easily damaged and proper handling and grounding is essential. Use ESD precautionary measures when installing parts or cards and keep the parts and cards in antistatic packaging when not in use. If possible, use antistatic floorpads and workbench pads.

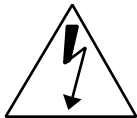
When handling components, or when setting switch options, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, such as a screwdriver or a paper clip, to set switches.

### Safety Guidelines

The following symbols are used when unsafe conditions exist or when potentially hazardous voltages are present:



*Caution statements identify conditions or practices that can result in damage to the equipment or in loss of data.*



*Warning statements identify conditions or practices that can result in personal injury or loss of life.*

Always use caution and common sense. *To reduce the risk of electrical shock, do not operate any equipment with the cover removed.* Repairs must be performed by qualified service personnel only.

- Never install telephone jacks in a wet location unless the jack is designed for that location.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- Use caution when installing telephone lines and never install telephone wiring during an electrical storm.

## Glossary of Terms

### **2B1Q Code**

Line code for basic rate ISDN at the U reference point.

### **Address**

A sequence of bits, a character, or a group of characters that identifies a network station, user, or application; used mainly for routing purposes.

### **Analog**

Transmission employing variable and continuous wave forms to represent information values.

### **BERT**

Bit Error Rate Test, or tester. (see Bit Error Rate.)

### **Bipolar**

The predominant signaling method used for digital transmission services, such as DDS and T1, in which the signal carrying the binary value successively alternates between positive and negative polarities. Zero and one values are represented by the signal amplitude at either polarity, while no-value “spaces” are at zero amplitude; also, polar transmission.

### **Bit Error Rate (BER)**

The percentage of received bits that are in error, relative to a specific amount of bits received; usually expressed as a number referenced to a power of 10; e.g., 1 in  $10^5$ .

### **CSU**

Channel Service Unit.

### **Data**

Digitally represented information, which includes voice, text, facsimile, and video.

### **DDS**

Dataphone digital service; private-line digital service offered intra-LATA by BOCs, inter-LATA by AT&T Communications, with data rates typically at 2.4, 4.8, 9.6, and 56 kbps; now a part of the services listed by AT&T under the Accunet family of offerings.

### **Diagnostics**

Tests used to detect malfunctions in a system or component.

### **Digital Customer Unit**

Component of customer premises equipment (CPE) used to interface to a two-wire circuit. Generally combined with an OCU-DDP-601. Performs conversion and multiplexing of customer's data stream(s) to 2B1Q line coding for transmission.

**Digital Loopback (DL)**

Technique for testing the digital processing circuitry of a communications device; may be initiated locally or remotely via a telecommunications circuit; device being tested will echo back a received test message, after first decoding and then reencoding it, the results of which are compared with the original message.

**DSU**

Data Service Unit.

**E1**

European telecommunications standard defined by CCITT standards G.703, G.704, and G.732.

**EIA**

Electronic Industries Association.

**Ground**

An electrical connection or common conductor that, at some point, connects to the earth.

**HDSL**

High-Bit Rate Digital Subscriber Loop.

**Interface**

A shared boundary; a physical point of demarcation between two devices, where the electrical signals, connectors, timing, and handshaking are defined; the procedure, codes, and protocols that enable two entities to interact for the meaningful exchange of information.

**Local Area Network**

A type of high-speed data communications arrangement wherein all segments of the transmission medium (typically, coaxial cable, twisted-pair wire, or optical fiber) are under the control of the network operator.

**Loopback**

Diagnostic procedure used for transmission devices; a test message is sent to a device being tested, which is then sent back to the originator and compared with the original transmission; loopback testing may be within a locally attached device or conducted remotely over a communications circuit.

**Modem**

Modulator/demodulator; electronic device that enables digital data to be sent over (typically) analog transmission facilities.

**Network**

An interconnected group of nodes; a series of points, nodes, or stations connected by communications channels; the assembly of equipment through which connections are made between data stations.

**Node**

A point where one or more functional units interconnect transmission lines (ISO); a physical device that allows for the transmission of data within a network; an end-point of a link or a junction common to two or more links in a network (IBM SNA); typically includes host processors, communications controllers, cluster controllers, and terminals.

**Self-Test**

A diagnostic test mode to check modem performance in which the modem is disconnected from the telephone facility and its transmitter's output is connected to its receiver's input, permitting the looping of test messages (originated by the modem test circuitry) through the modem.

**Terminal**

A point in a network at which data can either enter or leave; a device, usually equipped with a keyboard, often with a display, capable of sending and receiving data over a communications link (IBM).

**Transmission**

The dispatching of a signal, message, or other form of intelligence by wire, radio, telegraphy, telephony, facsimile, or other means (ISO); a series of characters, messages or blocks, including control information and user data; the signaling of data over communications channels.

# 1 System Description

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## Overview

Two versions of the 730 are available. The 730-D1 supports NX64 kbps customer digital data rates selectable from N=1 through N=18, over one HDSL loop. The 730-D2 supports NX64 kbps customer digital data rates selectable from N=1 through N=32 transmitted over two HDSL loops.

The 730-D1 has a maximum data rate of 1152 kbps, and the 730-D2 a maximum of 2048 kbps. The standard interface is ITU-T V.35, with optional piggyback cards for EIA-530 and X.21. These interfaces provides the transmit timing for the user's DTE equipment connected to the interface.

Both types of units are available in standalone and rackmount versions. The rackmount versions feature GDC's unique DataComm or Universal System Shelf packaging concept that allows a variety of data communications products including up to 16 units to be mounted in the same high density shelf.

Part numbers for standard and optional equipment for the 730-D1/D2 are listed in *Table 1-1. Technical Characteristics* are listed in *Appendix A*.

## Features

The DataComm 730-D1/D2 is a customer side interface of an HDSL system. It provides the following features:

- Configurable as either a Line Terminating Unit (LTU) or Network Terminating Unit (NTU).
- Software configurable through an optional ASCII terminal or hardware configurable via on board jumpers and switches.
- May be used as a Network Managed Element within a GDC Network Management System.
- ITU-T V.35 customer interface or optional EIA 530 or X.21 interfaces.
- Internal BERT capability.
- Local Loopback and Remote Digital Loopback capabilities.



## Applications

### Point-to-Point

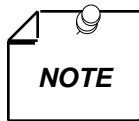
The 730-D1/D2 can operate in one of several configurations. Three are shown in *Figure 1-1*. This application provides bandwidth of  $N \times 64$  kbps for  $N=1$  to  $N=18$  for the 730-D1 and  $N=1$  to  $N=32$  for the 730-D2. Both units in the HDSL system must be configured for the same data rate.

### Point-to-MultiPoint

This application accomplishes E1 provisioning services. Bandwidth at each remote 730-D1 supports  $N \times 64$  kbps for  $N=1$  up to  $N=18$ . The total bandwidth of the combined remote DataComm 730-D1s may not exceed  $N=31$ . E1 time slot allocation is determined at the 700-G3 side of the HDSL system.

### Fractional G.704 Service

This application provides for Fractional G.704 service. Bandwidth is  $N=1$  up to  $N=18$  for the 730-D1 and up to  $N=32$  for 730-D2. G.704 time slot allocation is left justified for rates up to  $N=31$ . If  $N=32$  is desired, the 700-G2 or 720-G2 must be configured in UNFRAMED mode.

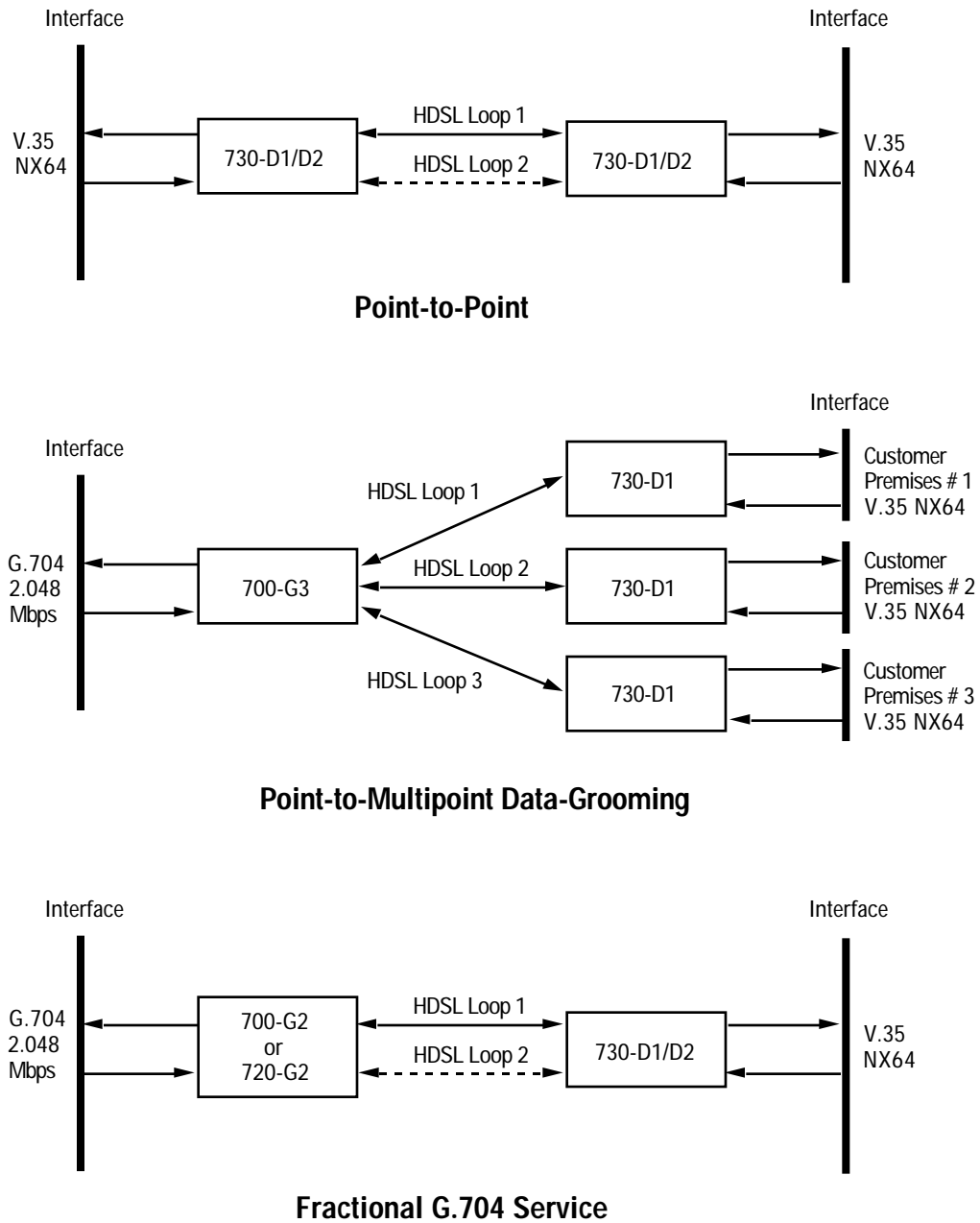


*Other applications may be found in Chapter 5 of this manual.*

## Diagnostics/Network Management

Operation and parameters are controlled by switches and jumpers mounted on the printed circuit card. A front panel terminal interface jack labeled CTRL is also provided on the 730. This terminal interface enables access to the full set of menu-driven diagnostic and configuration controls via a standard terminal interface. This includes loopback and test pattern control, access to performance monitoring, and configuration control. Instructions for using this terminal feature are in *Chapter 2, Installation*.

The 730 may also be used as a standalone unit as part of the Universal Access System (UAS). The UAS is a family of network managed metallic loop transmission products. A shelf mounted UAS family member interworks with a standalone unit located at the far end of the access loop. Full network management capabilities are achieved using the SpectraComm Manager (SCM) and its interface to MEGAVIEW ( a UNIX workstation) or a PC based SNMP controller .



**Figure 1-1** Typical DataComm 730-D1/D2 Applications

**Table 1-1** Equipment List

<b>Description</b>	<b>GDC Part No.</b>
DataComm 730-D2 (rackmount)	073P210-001
DataComm 730-D2 (standalone - 117V)	073A210-001
DataComm 730-D2 (rackmount - X.21)	073M210-011
DataComm 730-D2 (rackmount - 530)	073M210-021
DataComm 730-D2 (standalone - 117V/X.21)	073A210-011
DataComm 730-D2 (standalone - 117V/530)	073A210-021
DataComm 730-D1 (rackmount)	073P210-002
DataComm 730-D1 (rackmount - X.21)	073P210-012
DataComm 730-D1 (rackmount - 530)	073P210-022
DataComm 730-D2 (standalone - 220V)	073A210-002
DataComm 730-D2 (standalone - 220V/X.21)	073M210-012
DataComm 730-D2 (standalone - 220V/530)	073M210-022
DataComm 730-D2 (standalone - 100V)	073A210-003
DataComm 730-D2 (standalone - 100V/X.21)	073A210-013
DataComm 730-D2 (standalone - 100V/530)	073P210-023
DataComm 730-D2 (standalone - 240V)	073P210-004
DataComm 730-D2 (standalone - 240V/X.21)	073P210-014
DataComm 730-D2 (standalone - 240V/530)	073P210-024
<b>Cables</b>	
Interface cable RJ48C plug to 9-pin female (HDSL CTRL port to terminal connection)	027H250-010
Cable assembly V.35 straight-through M/M	027H516-xxx
Adapter cable 37-pin female to 25-pin male (use with customer provided cable for RS-449 equipped. with DC 730 equipped with EIA-530 Channel Interface Card	023H501-xxx
Cable assembly DB-25M to DB-15F X.21 Adapter	027H436-001
Cable assembly DB-25M to V.35M Adapter	070H002-001
Adapter Cable 37-pin male to 25-pin male (use with customer provided cable for RS449 equipment with DataComm 730 equipped with EIA 530 Channel Interface Card.	023H603-xxx

**Table 1-1** Equipment List (Cont.)

Enclosure/Shelves	
DE Cover	010D500-003
Base Assembly, 730-D1/D2, 117 Vac	010B038-011
Base Assembly, 730-D1/D2, 220/240 Vac	010B180-005
Base Assembly, 730-D1/D2, X.21/530, 117 Vac	010B038-001
Base Assembly, 730-D1/D2, X.21/530, 220 Vac	
Base Assembly, 730-D1/D2, X.21/530, 240 Vac	010B180-005
DataComm Shelf, DS-1, 117 Vac	010B015-001
DataComm Shelf, DS-5R, -48 Vdc redundant power supplies	010M011-001
DataComm Shelf, DS-5NR, -48 Vdc non-redundant power supply	010M011-002
DataComm Shelf, DS-6R, -48 Vdc redundant power supplies, NEBS-compliant dimensions	010M047-001
DataComm Shelf, DS-6NR, -48 Vdc non-redundant power supply, NEBS-compliant dimensions	010M047-002
Universal System Shelf USS-1-D, 117 Vac, Domestic	010B080-001
Universal System Shelf USS-1-DC/NR, -48 Vdc non-redundant power supply	010M040-001
Universal System Shelf USS-1-DC/R, -48 Vdc redundant power supply	010M040-002



# 2 Installation

---

## Overview

This chapter guides you through the process of installing and using the 730-D1 and 730-D2 in your communications network. If this is your first experience using these units you may wish to review *Chapter 1* to ensure that you understand the key features and the process of installing and using the unit in your network.

## Unpacking And Handling

Inspect the unit for damage; if any is observed, notify the shipper immediately. Save the box and packing material; you can use it to reship the unit, if necessary.

## Installation Requirements

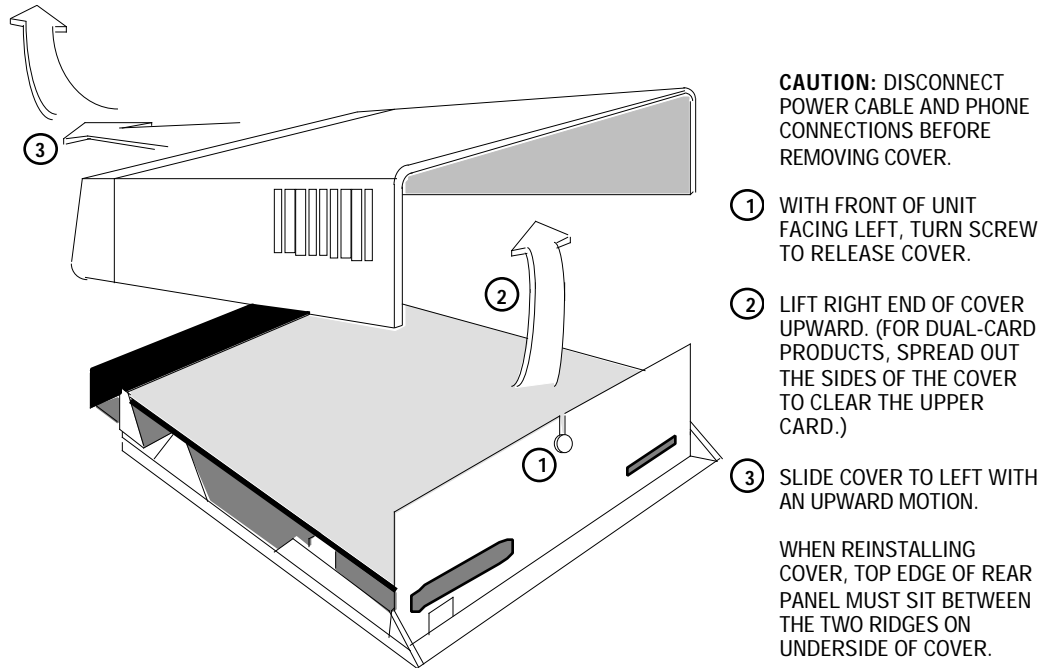
You may install the 730-D1 and 730-D2 basecard in a standalone DataComm Enclosure or rackmounted in a DataComm or Universal System Shelf (USS).

Place the unit directly in a ventilated area where the ambient temperature does not exceed 122°F(50°C).

Do not install the unit directly above equipment that generates a large amount of heat (such as power supplies).

## Standalone Installation

If you need to remove the component cards from the standalone base, disconnect the power supply connector from J7 mounted at the rear center of the base card. When you reinstall the component cards to the base, reinstall the connector at J7. See Figure 2-1.



**Figure 2-1** Standalone Cover Removal Procedure

## Rackmount Installation

The 730-D1 and 730-D2 mounted in a DataComm Shelf (DS-1, DS-5 or DS-6) supports as many as 16 units. You may install the units in any unused slot in the shelf. Install the unit in the shelf as follows:

1. Position the card in the top and bottom slot guides with the GDC logo on top, and carefully slide the assembly into the slot until it stops at the rear connectors.
2. Push the front panel with both hands until the assembly mates with the rear connectors.

The Universal System Shelf (USS-1) accommodates 16 730's. The USS-1 uses harness cards and backplanes configured to occupy one card slot in the shelf for each unit.

Each backplane assembly is keyed by a tab located at the bottom of the harness card. This tab mates with a slot that is part of the shelf and prevents the backplanes from being inserted incorrectly in the shelf.

Install the 730 in the USS-1 shelf, as follows:

1. Loosen the backplane screws and install the plug-in card from the front of the shelf by sliding it into the card guides.
2. Seat firmly into the mating connectors on the backplane using both hands.

3. Tighten the backplane screws. This assures perfect alignment of the cards in the card guides and the mating connectors on the backplane and allows for easy removal of the cards.
4. Plug in the four-pin cable harness on the backplane adapter to the shelf power connector located directly above the backplane adapter.

## Setting Hard Options

Setting the hard options on the DataComm 730 basecard means adjusting configuration switches and jumpers to match your networks operation. *Table 2-1* explains the functions of the switches and jumpers and *Figure 2-1* shows their location. The hard configuration option is selected by switch S34-1.



*The microprocessor in the DataComm 730 reads the switch settings only when you first power up. If you change the settings while the power is on, you must turn the power off and power up again for the new settings to take effect. Soft options that are changed while power is on, do not require a power cycle. Soft options are stored in non-volatile memory and do not need to be reset after power interruption.*

You need to make these adjustments only once, when first installing the unit. You don't have to repeat the procedure, unless you change your network or connect a different device to a data channel.

**Table 2-1** Option Selection

Switches	Description
S34-1 (SOFT/HARD)	OFF = Soft - Allows 730-D1/D2 configuration control through the terminal or a GDC SNMP managed Universal Access System. ON = Hard - Allows the 730-D1/D2 configuration through dip-switch settings.
S34-2 (ENLOOPS 0) S34-3 (ENLOOPS 1)	Allows a 730-D2 to operate over 1 HDSL loop: <b>ENLOOPS 0 ENLOOPS 1</b> S34-2 S34-3 OFF ON HDSL Loop 1 Enabled ON OFF HDSL Loops 1 and 2 Enabled
S34-4 (NTU/LTU)	OFF = NTU - The 730-D1/D2 operates as a network termination unit, located on the user's side. ON = LTU - The 730-D1/D2 operates as a line termination unit located on the central office side. In this mode the 730-D1/D2 serves as the master unit with respect to timing and supervision of the NTU.
S34-5 (P2P/P2MP)	OFF = P2P - Point-to-point alternating E1 timeslots on HDSL loops. ON = P2MP - Point-to-multipoint data grooming application.
S34-6 (FPEN/DIS)	OFF = Disables front panel switches RL, LL and ST. ON = Enables front panel switches RL, LL and ST.
S34-7 (CH-CK-0) S34-8 (CH-CK-1)	Selects timing: <b>CH-CLK-1 CH-CLK-0</b> S34-8 S34-7 OFF "don't care" Looped The DCE transmit clock is locked to the DCE receive clock and is developed from the incoming remote end timing. ON OFF Internal The DCE transmit clock is derived from the internal clock oscillator of the 730-D1/D2. ON ON External The DCE uses an external transmit clock provided by the customer's DTE.



**Table 2-1** Option Selection (Cont.)

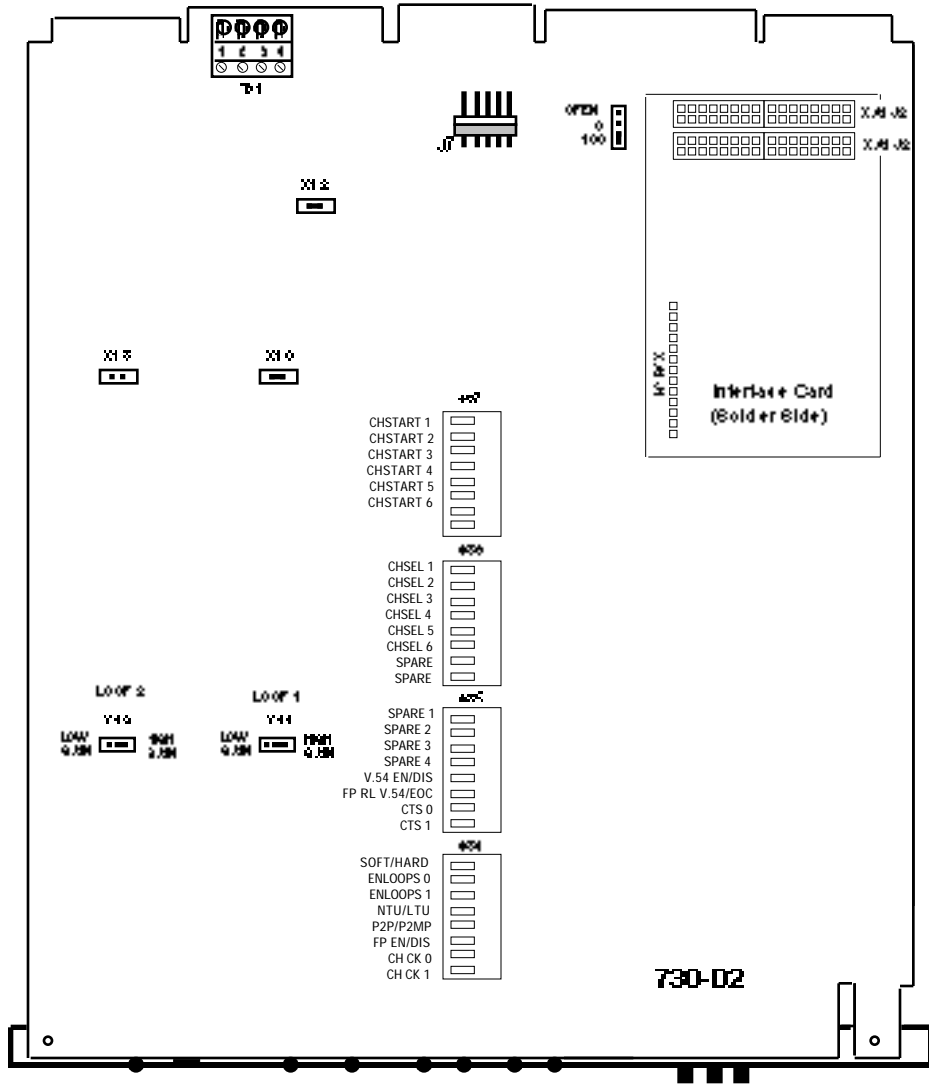
<b>Switches</b>	<b>Description</b>																		
S35-1 and 2 (SPARE)	Future Use.																		
S35-3 (SPARE)	Future Use.																		
S35-4 (SPARE)	Future Use.																		
S35-5 (V.54 EN/DIS)	Enabled - Unit will acknowledge V.54 inboard loopback code. Disabled - Unit will not acknowledge V.54 loopback code.																		
S35-6 (FP RL V54/EOC)	Front panel RL button sends V.54 code. FP-RL-EOC - Front panel RL button sends EOC loopback.																		
S35-7 (CTS0) S35-8 (CTS1)	<table border="0"> <tr> <td><b>CTS1</b></td> <td><b>CTS0</b></td> <td></td> </tr> <tr> <td>S35-8</td> <td>S35-7</td> <td></td> </tr> <tr> <td>OFF</td> <td>OFF</td> <td>CTS line ON if HDSL is operating normally.</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>CTS line ON if HDSL is operating normally</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>CTS line tracks RTS line</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>CTS line ON if HDSL is operating normally</td> </tr> </table>	<b>CTS1</b>	<b>CTS0</b>		S35-8	S35-7		OFF	OFF	CTS line ON if HDSL is operating normally.	ON	OFF	CTS line ON if HDSL is operating normally	OFF	ON	CTS line tracks RTS line	ON	ON	CTS line ON if HDSL is operating normally
<b>CTS1</b>	<b>CTS0</b>																		
S35-8	S35-7																		
OFF	OFF	CTS line ON if HDSL is operating normally.																	
ON	OFF	CTS line ON if HDSL is operating normally																	
OFF	ON	CTS line tracks RTS line																	
ON	ON	CTS line ON if HDSL is operating normally																	
S36-1 through S36-6 (CHSEL 1 through 6)	See Table 2-1 on next page.																		
S36-7 (SPARE)	Future Use.																		
S36-8 (SPARE)	Future Use.																		
S37-1 through S37-6 (CHSTART1-CHSTART6)	Future Use.																		
S37-7 (SPARE)	Future Use.																		
S37-8 (SPARE)	Future Use.																		
<b>Jumpers</b>	<b>Description</b>																		
X1	Select <b>0</b> for common signal and chassis grounds. Select <b>100</b> for grounds isolated by 100 ohm resistor. Select <b>Open</b> for isolated signal and chassis grounds.																		
X10, X18	Install X10. Do not install X18.																		
X11, X19	Sets the HDSL gain for each HDSL channel: X11 is for loop 1 and X19 is for loop 2. Should be set HIGH unless otherwise specified on the optional terminal screen. This screen designation is found under the DIAGNOSTICS/HDSL STATUS screen - "GAIN SHOULD BE..." See Chapter 2 'Setting Soft Options'.																		
X12	Must be installed.																		

**Table 2-1** Option Selection (Cont.)

Data Rate (X64 kbps)	S36-6	S36-5	S36-4	S36-3	S36-2	S36-1
32	OFF	ON	ON	ON	ON	ON
31	ON	OFF	OFF	OFF	OFF	OFF
30	ON	OFF	OFF	OFF	OFF	ON
29	ON	OFF	OFF	OFF	ON	OFF
28	ON	OFF	OFF	OFF	ON	ON
27	ON	OFF	OFF	ON	OFF	OFF
26	ON	OFF	OFF	ON	OFF	ON
25	ON	OFF	OFF	ON	ON	OFF
24	ON	OFF	OFF	ON	ON	ON
23	ON	OFF	ON	OFF	OFF	OFF
22	ON	OFF	ON	OFF	OFF	ON
21	ON	OFF	ON	OFF	ON	OFF
20	ON	OFF	ON	OFF	ON	ON
19	ON	OFF	ON	ON	OFF	OFF
18	ON	OFF	ON	ON	OFF	ON
17	ON	OFF	ON	ON	ON	OFF
16	ON	OFF	ON	ON	ON	ON
15	ON	ON	OFF	OFF	OFF	OFF
14	ON	ON	OFF	OFF	OFF	ON
13	ON	ON	OFF	OFF	ON	OFF
12	ON	ON	OFF	OFF	ON	ON
11	ON	ON	OFF	ON	OFF	OFF
10	ON	ON	OFF	ON	OFF	ON
9	ON	ON	OFF	ON	ON	OFF
8	ON	ON	OFF	ON	ON	ON
7	ON	ON	ON	OFF	OFF	OFF
6	ON	ON	ON	OFF	OFF	ON
5	ON	ON	ON	OFF	ON	OFF
4	ON	ON	ON	OFF	ON	ON
3	ON	ON	ON	ON	OFF	OFF
2	ON	ON	ON	ON	OFF	ON
1	ON	ON	ON	ON	ON	OFF

### EIA-530 or X.21 Interface Card

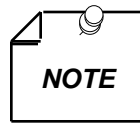
The optional EIA-530 or X.21 Interface Card provides these interfaces for the DTE. They are available factory installed, or as a field upgrade kit. They plug into the base card illustrated in *Figure 2-2*. (You can also remove the card(s) and place jumpers on XA1J2 and XA1J3 to make the base card interface active.) When you install the optional X.21 Interface Card in the active position, DTE control of Remote Terminal Test and Local Loopback is not supported. *Appendix B* describe the signals exchanged through the business equipment interface. Optional transmit signal timing, X.21 Interface Card jumper position BT, (Byte Timing) is not supported.



**Figure 2-2** Option Switch And Jumper Locations, Basecard

## Electrical Connections

The following paragraphs describe the power and line connections to the DataComm 730.



*Before you power the unit up, refer to the Preoperational Hard/Soft paragraphs that follow the Electrical Connections information.*

### Power - Standalone

Attach the appropriate power cord to the rear panel IEC connector or the wall receptacle (depending on the base assembly you ordered). The unit should be powered by the same ac source as the equipment interfaced with the unit to prevent large circulating currents caused by differences in ground potential. If you cannot determine whether the equipment is powered by the same ac source, verify that a potential difference of less than 0.25 V rms exists between the grounding circuits of the respective power outlets.

### Power - Rackmount Shelf

The unit obtains power directly from the shelf when properly installed as instructed under Rackmount Installation.

### Business Equipment Connections

You may make the Business Equipment connections to the 730-D1 and 730-D2 standalone enclosures using a variety of connectors depending on the base assembly that was ordered. Refer to *Figures 2-3* and *2-4* for these connections.

### HDSL Line Connections

You may make HDSL line connections to the 730-D1/D2 standalone using TB2 which is located on the basecard. Refer to *Figures 2-3* and *2-4*.

If the unit is rackmounted in the DataComm or USS-1 shelf, you connect the two-wire lines according to *Figure 2-5*. If you mount the unit in the Universal System Shelf (USS-1D or USS-1DC), you must first remove the plastic cover attached at the rear of the backplane to expose the VF terminal blocks. These blocks accommodate wires that do not have terminal lugs. Remove the lugs and a portion of the insulation from the existing cable and insert the wires into the block by first unscrewing the captive screw for that portion of the terminal. Connect the wires according to *Figure 2-5*, and replace the plastic cover.

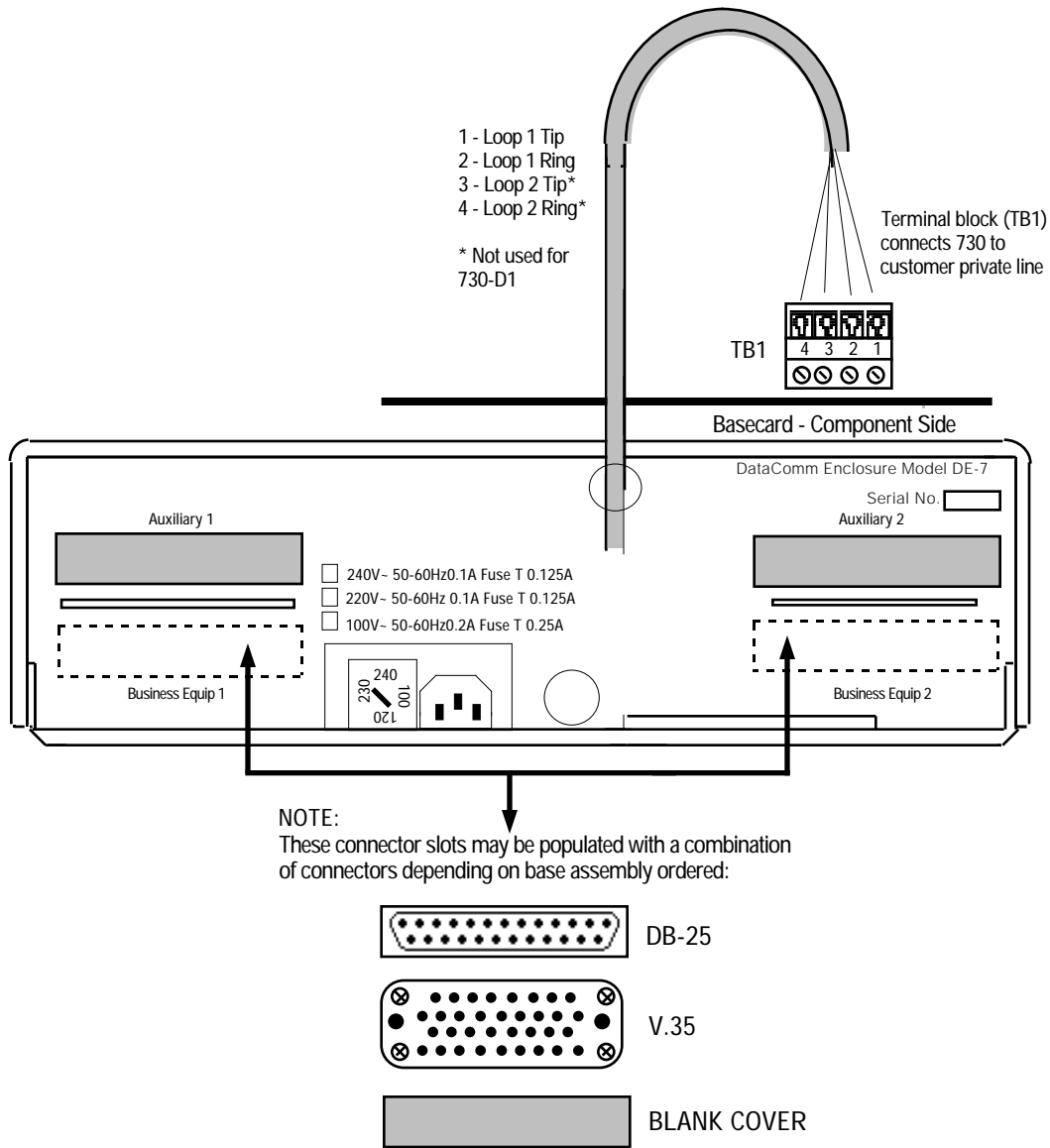
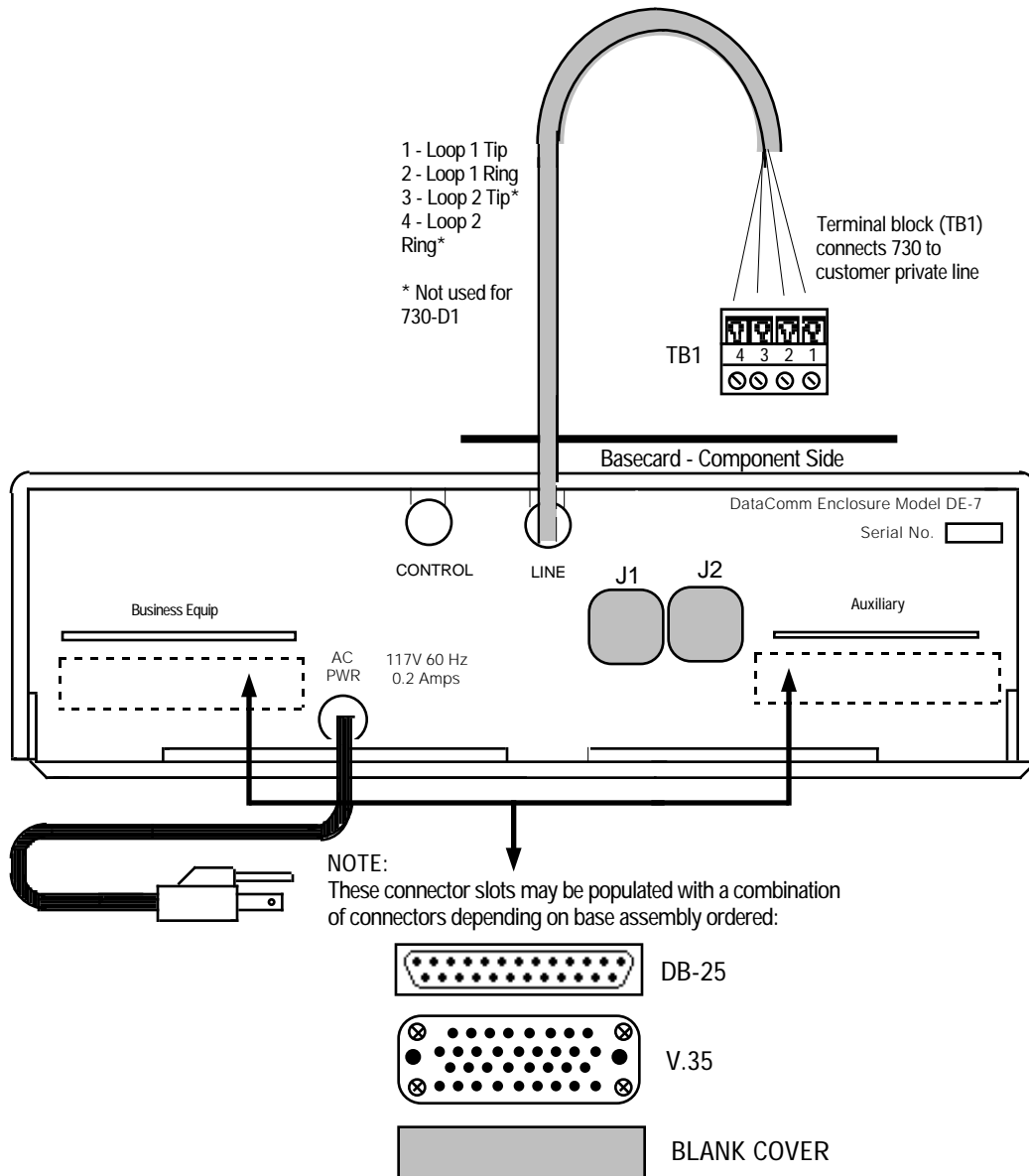


Figure 2-3 DE-27E Standalone Enclosure Rear Panel

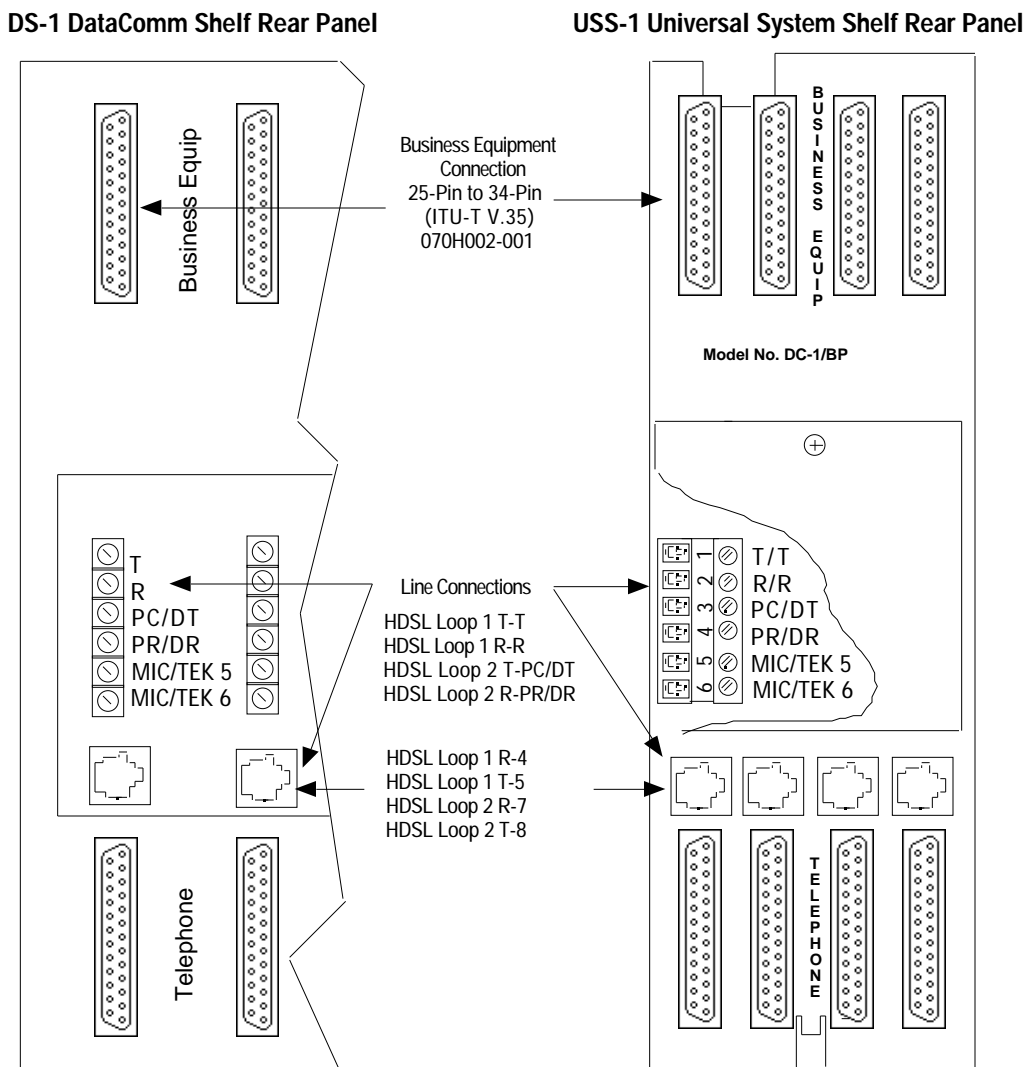


**Figure 2-4** DE-7 Standalone Enclosure Rear Panel

If the unit is rackmounted in the DataComm Shelf (DS-1, DS-5 or DS-6), you connect the two-wire lines according to *Figure 2-5*. If you mount the unit in the Universal System Shelf (USS-1D or USS-1DC), you must first:

1. Remove the plastic cover attached at the rear of the backplane to expose the VF terminal blocks. These blocks accommodate wires that do not have terminal lugs.
2. Remove the lugs and a portion of the insulation from the existing cable and insert the wires into the block by first unscrewing the captive screw for that portion of the terminal.
3. Connect the wires according to *Figure 2-5*, and replace the plastic cover.

In either case, DataComm or Universal System Shelf, before making the connection, verify that the terminal block corresponds to the shelf receptacle in which the 730 card is installed.



**Figure 2-5** DataComm And Universal System Shelf Rear Panel Connections

## Preoperational Configuration Setup

### Hard

Configure the unit as follows:

1. On the basecard, fix the HDSL receiver gains to LOW (X12, X16) and verify that jumpers X11 and X15 are installed. Verify that the card is configured as an LTU or NTU based upon *Table 2-1*.
2. Set the remaining switches and jumpers according to *Table 2-1* and *Figure 2-1*. If S34-1 is placed in the SOFT configuration position, all other switch settings are ignored, and the unit must be configured via the optional terminal screen. Refer to Setup (Soft).
3. Connect the DTE interface and HDSL loops to the network connectors on the rear panel.
4. Apply power to the unit.
5. The card automatically performs internal self-tests. If one of these tests fails, the front panel ALM LED blinks.
6. Follow step 5 under Setup (Soft).

### Soft

1. Follow steps 1 through 5 above.
2. Connect a terminal to the CTRL connector on the front panel.
3. To view the test results on the terminal, go to the View H/S Config Screen on the terminal. Refer to *Chapter 3* paragraph - "Setting Soft Options."
4. After performing the self-tests, the HDSL loops (LTU and NTU) initiate start-up, and the HDSL green LEDs should blink. Verify that the HDSL receiver gain on each loop is the same as displayed on the terminal's HDSL Status screen. If the gains are configured differently than specified on the terminal screen, reconfigure the cards jumpers (X12, X16) to match the HDSL Status Screen specifications. The start-up should last less than 3 minutes. When complete, the HDSL NORM LEDs should be ON and the HDSL ES LEDs should be OFF. If not, the start-up failed. The two cards automatically initiate a new start-up procedure. During this time, the ALM LED will blink until all HDSL and E1 status indicators clear.
5. Data transfer should occur, DTE indicators RD and SD should be ON. The NORM LED should be ON, and the ES LED should be OFF. If not, refer to the troubleshooting procedure in *Chapter 4*.





# 3 Operation

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## Overview

*Figure 3-1* illustrates the DataComm 730-D2 front panel and explains the function of each control and indicator. You may check the operation of the unit by monitoring the front panel indicators and using the test procedures provided in *Chapter 4*.

You can find some unit configurations for typical applications in *Chapter 5*.

Once the options are set and the communication line properly connected, the units need no additional operator commands. The units are transparent to your network and communicate automatically with each other and with your connected network devices.

## Front Panel Description

The front-panel red and green indicators (LEDs) are described below:

The red LED indicates critical or major failure or error. The green LED indicates satisfactory operation or completion of a process.

**Data Path Indicators** - Three data streams are visually monitored:

1. HDSL loop 1 input
2. HDSL loop 2 input
3. DTE Interface

Two indicators are used for each data stream:

The green LED is designated as NORM indicates the status of the system. The red LED is referred to as ES and indicates the data transport status.

Each LED can be in one of three states: ON, blinking, or OFF, (Blinking is at a 2 Hz rate) *Table 3-1* summarizes.

**Table 3-1** Front Panel Indicators

HDSL Indicators		
ES	NORM	Indication
OFF	ON	Normal operation
ON	OFF	LOS/LOSW
ON (for .5 sec.)	ON	ES - Errored second
ON	Blink	Start-up tests, No response from mating unit
OFF	Blink	Start-up in progress

Two additional LEDs are available and indicate transmit and receive data at the customer DTE interface.

Three additional indicators are used on the front panel:

**ON** - Lit when +5V is applied to the card.

**ALM** - Indicates if a 'Major Alarm' is present. If a failure was detected during self-test, this LED blinks. Additionally, it blinks upon the detection of LOS, LOSW, or UAS on any HDSL loop.

**TM** - This LED is on during one of the following conditions:

Loopback is activated at the local unit.

Loopback is activated by the remote unit.

The BER meter has been activated, or any self-test is in progress.

The TM LED blinks when a BER test is in progress and bit errors are present.

**ST push button** - Pushing the ST button activates a  $2^{15}$  pseudo-random test pattern while enabling the simultaneous detection of an incoming  $2^{15}$  pattern.

**LL push button** - Pushing this button initiates the same loopback as the "Local Line Loopback" described in *Chapter 4*. The unit must be configured for external timing for this loopback to be functional.

**RL push button** - Pushing this button initiates the same loopback as the "Remote Line Loopback" described in *Chapter 4*. The RL push button is functional when the unit is configured as a LTU, or whenever V.54 inband signaling has been enabled.

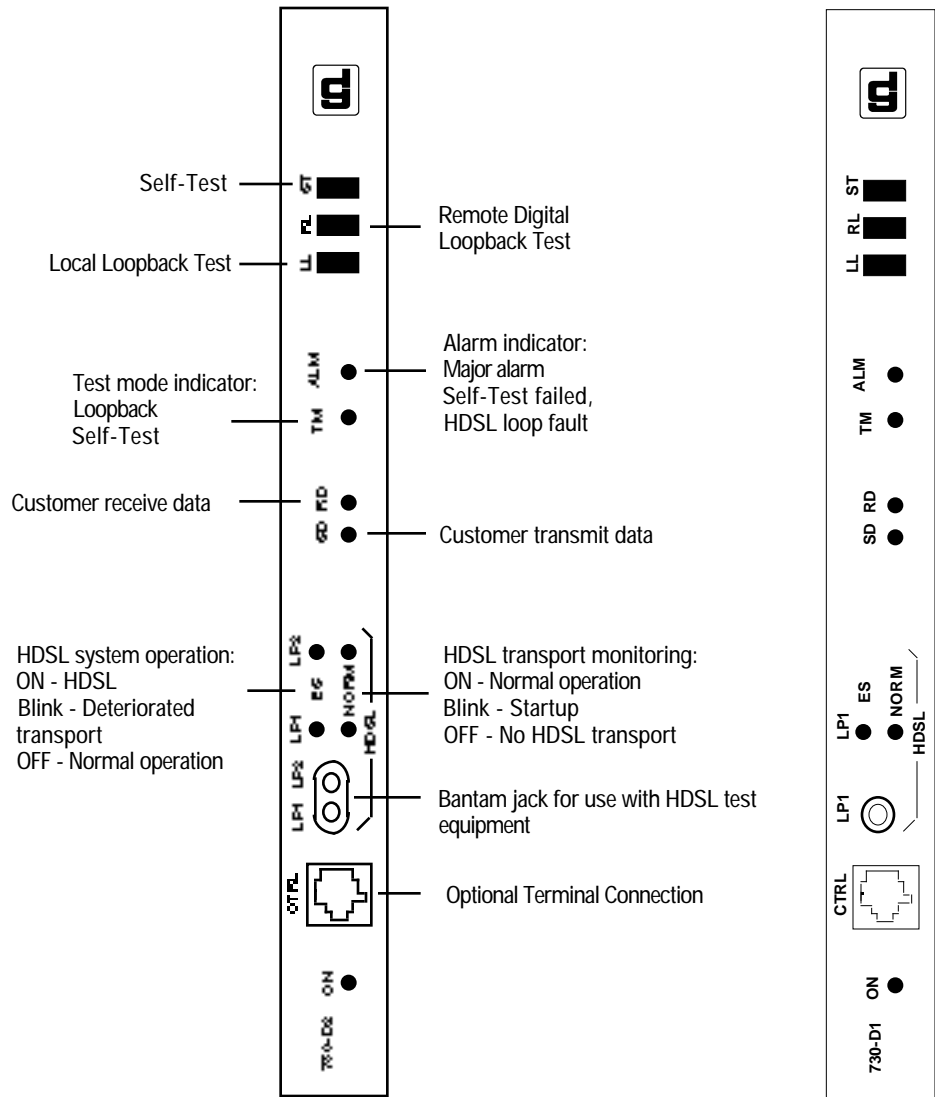


Figure 3-1 The Front Panels

## Soft Option Selection

You can use an optional terminal (a standard ASCII terminal equipped with an EIA/TIA-232-E communication interface) connected to the Control (CTRL) jack on the front panel for configuration and control of the 730.

## Terminal Requirements

You can use any standard ASCII terminal (VT100 or ANSI terminal or personal computer emulating an ASCII terminal) equipped with an EIA/TIA-232-E communication interface can be used to control the 730 operation. The following screens



## Screen Organization

The screen includes the areas described in *Table 3-2*.

**Table 3-2** Terminal Screen Organization

Header	Located at the top of the screen, the header displays GDC name and equipment model, followed by the current operating mode (LTU or NTU), and the date and time sent by the 730.
Status Line	Located below the header, the status line includes two main fields, which display the status of the various 730 alarms and status signals. An active alarm and status indicators are displayed in reverse video.
DTE Field	Includes the following indications: TM, DCD, DTR, RTS
Loop Alarms Field	Loop alarms field is divided into several sub fields, one for each loop and includes the following indications: LOS - Loss of input signal on the corresponding loop. UAS - Unavailable seconds threshold for the corresponding loop is being exceeded. LOSW - Loss of synchronization word on the corresponding loop.
Work Area	Displays the menu and dialog boxes.
Active Keys Area	The active keys are constantly updated to show the keys and key combinations you can use on the current screen.

## Operating Procedures

The following procedures apply to all the operations that you perform on the optional terminal.

### Menu Selection

You can select a Menu item in two ways:

1. Move the selected block to the desired item by means of the arrows, then press the Enter key.
2. Type the number appearing to the side of the menu item.

Either action opens the sub menu or dialog box used to perform the selected operation.

### Field Navigation

To move forward among the fields of a dialog box, press the Down arrow key. To move backward, press the Up arrow key.

### Field Editing

You can modify the values displayed in the screen fields as follows:

1. Bring the cursor to the desired field, and then press Enter to display an option menu with the available values.
2. Highlight the desired value then press Enter to select the new value and close the option menu.

- For free-text fields, bring the cursor to the desired field, then type in the desired value.

You can use the Backspace and Delete keys to make changes or correct errors. When done, press Enter.

## Restoring Default Values

When the 730 stores default values for parameters displayed in a dialog box, you can replace the current values with the default values by pressing Ctrl D (Ctrl D means hold down the Ctrl (control) key and press D).

## Saving Values

To save new parameter values entered in dialog boxes, press Ctrl W. These parameters are stored in non-volatile memory for use upon the next unit power-up in SOFT Config mode (S34-1 switch is set to SOFT).

## Quitting Without Saving

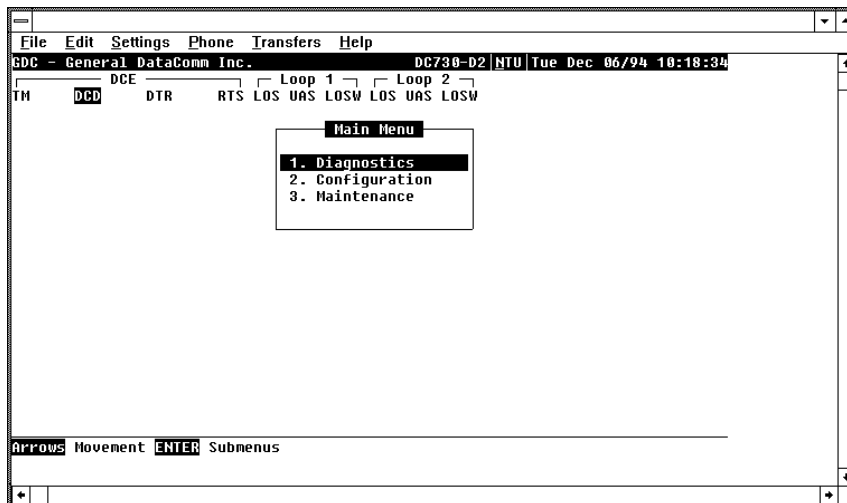
To quit without saving the new parameter values entered in a dialog box, press Esc.. You can also press Esc as necessary to close any open submenus and to return to the main menu.

## Refresh

You may refresh the screen at any time by typing Ctrl-R.

## Main Menu

The Main Menu is displayed in *Figure 3-3*. The menu includes four options, described in the following paragraphs.



**Figure 3-3** Main Menu

## Diagnostics Option

Use this option to display diagnostic information and to activate or control diagnostic functions, as follows:

- Display of performance statistics collected on each of the HDSL loops.
- Display HDSL loop status information, technical data on loop performance, HDSL loop noise margins, optional gain settings, etc.
- Cancel the start-up process.

### Configuration Option

Use this option to configure the data interface and HDSL loop parameters, as follows:

- Modify the HDSL loop operating mode (NTU or LTU), number of loops enabled, and application type (point-to-point, point-to-multipoint), and front panel enable.
- Display and modify the interface configuration, TX Clock mode, CTS mode, V.54 and RL pushbutton options, and Data Rate.
- Display system hardware and software data and 730 self-test results.

### Maintenance Option

Use this option to perform maintenance activities, as follows:

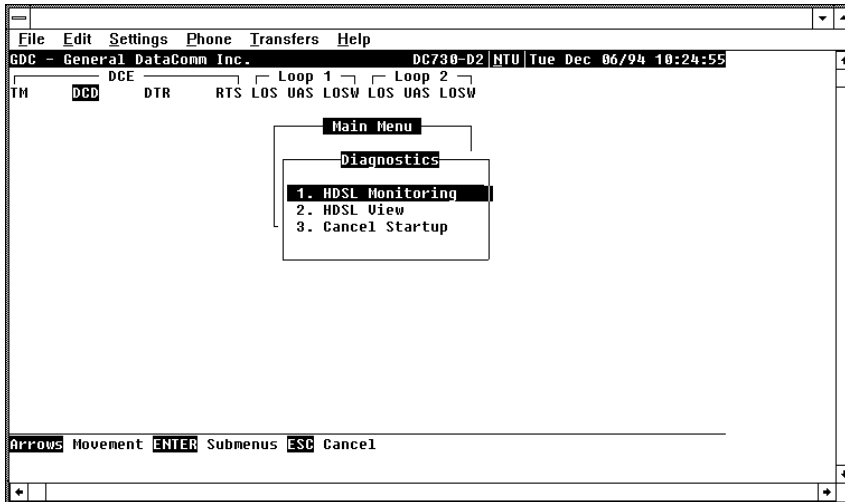
- Enable both local and remote system loopbacks.
- Test system performance using the internal 730 BER meter.
- Set the real-time clock.
- Reset the statistics counters.
- Initiate manually the start-up process.
- Reset the 730. (Simulate a power-up.)

These screens are described in *Chapter 4* under Maintenance Menu.



## Diagnostic Menu

You can use the diagnostic menu to display diagnostic information, and to activate diagnostic functions. See *Figure 3-4* . To open the diagnostics menu, select item 1 on the main menu.



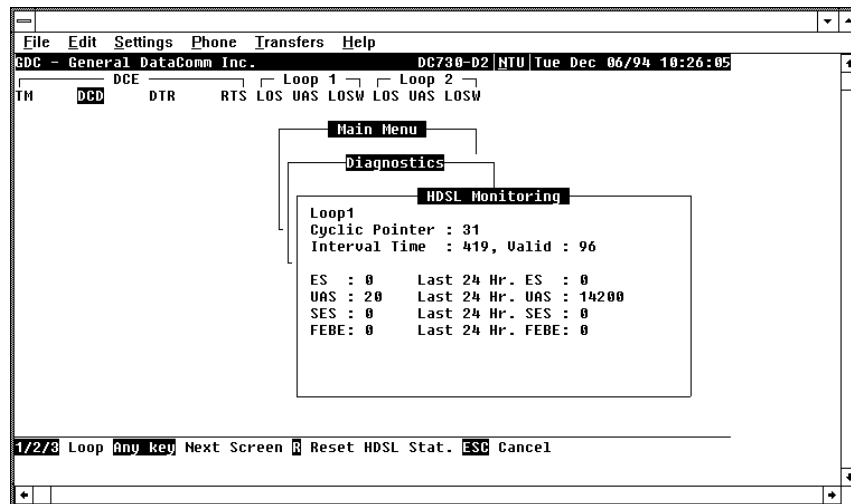
**Figure 3-4** Diagnostic Menu

The functions available from the diagnostic menu are as follows:

- HDSL Monitoring
- HDSL View
- Cancel Startup

### HDSL Monitoring

The HDSL Monitoring screen, *Figure 3-5*, displays 24-hour performance statistics on the HDSL loops. To display the HDSL monitoring screen, select item 2 on the diagnostic menu.



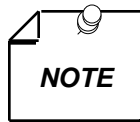
**Figure 3-5** HDSL Monitoring Screen

The screen includes the fields described in *Table 3-3*.

**Table 3-3** HDSL Monitoring Screen

Cyclic Pointer	Displays the number sequence of the current 15-minute interval within the current 24-hour interval. The range is 0 to 95. HDSL error statistics ES, UAS, and SES are reported consistent with ITU G.821.
Interval Time	Displays the elapsed time in seconds from the beginning of the current 15-minute interval. The range is 0 to 900.
ES	Displays the number of errored seconds in the current 15-minute interval.
Last 24 Hr ES	Displays the number of errored seconds in the last 24-hour interval.
UAS -	Displays the number of unavailable seconds in the current 15-minute interval.
Last 24 Hr UAS	Displays the number of unavailable seconds in the last 24-hour interval.
SES	Displays the number of severely errored seconds in the current 15-minute interval.
Last 24 Hr SES	Displays the number of severely errored seconds in the last 24-hour interval.
FEBE	Displays the number of Far-End-Block-Errors reported by the remote equipment in the current 15-minute interval.
Last 24 Hr FEBE	Displays the number of Far-End-Block-Errors reported in the last 24-hour interval.

To select another loop, type its number: 1 or 2.



*Powering up the 730-D1/D2 resets the 24 hour performance statistics on the HDSL loops.*

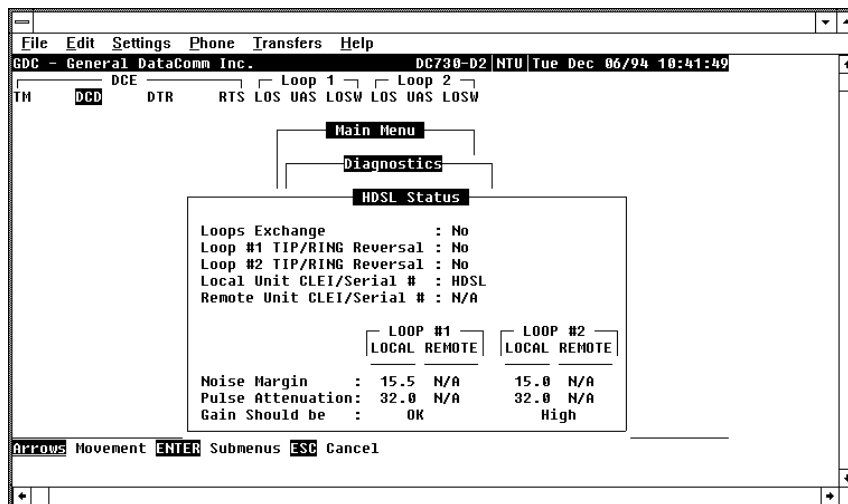
After viewing the data collected for the selected loop in the current 15-minute interval, you can display the other 95 intervals within the current 24-hour interval by pressing any key, except 1, 2, 3, R, and Esc keys. The display is cyclic, that is, the current interval is displayed again after the 95th interval.

To reset the HDSL statistics counters, type **R**. All the displayed values are reset to 0.

To exit and return to the **Diagnostics** menu, press the Esc.

## HDSL View

The option displays the HDSL Status screen, which shows you diagnostic information and technical data on HDSL loop performance. A typical screen is shown in *Figure 3-6*.



**Figure 3-6** HDSL View Screen

Table 3-4 describes the fields on the HDSL Status screen.

**Table 3-4** HDSL Status Screen Fields

Loops Exchange	Indicates whether the HDSL loops carrying the data traffic are correctly connected or have been interchanged by error. This information is available only when the unit connected in a link can exchange information with the remote unit. Not applicable if unit is configured as an LTU.
Loop 1 TIP/RING Reversal	Indicates whether the two conductors of HDSL loop 1 are correctly connected or have been interchanged by error. This information is available only when the unit connected in a link can exchange information with the remote unit. Not applicable if unit is configured as an LTU.
Loop 2 TIP/RING Reversal	Indicates whether the two conductors of HDSL loop 2 are correctly connected or have been interchanged by error. This information is available only when the unit connected in a link can exchange information with the remote unit. Not applicable if unit is configured as an LTU.
Local Unit CLEI/Serial #	For future use.
Remote Unit CLEI/Serial #	For future use.
Noise Margin <i>Valid only when X11 and X19 are set to HIGH.</i>	Displays amount of additional noise in dB which can be tolerated before exceeding $5 \times 10^{-8}$ bit error ratio. Separate values are provided for each HDSL loop.
Pulse Attenuation <i>Valid only when X11 and X19 are set to HIGH.</i>	Displays the pulse attenuation, in dB, measured by the signal processing circuits of the 730. Separate values are provided for each HDSL loop for the local unit.
Gain Should Be	Indicates the optimal receiver gain value that should be set. This value is calculated by the signal processing circuitry of the 730.

### Operation

To display the HDSL Status screen, select item 2 on the Diagnostics menu. After viewing the data, press Esc to exit and return to the Diagnostic menu.

### Cancel Start

The Cancel Startup option is used to cancel the start-up process performed by the 730 upon link initialization and whenever the synchronization between two GDC HDSL units connected in a link is lost. This function enables partial operation under fault conditions.

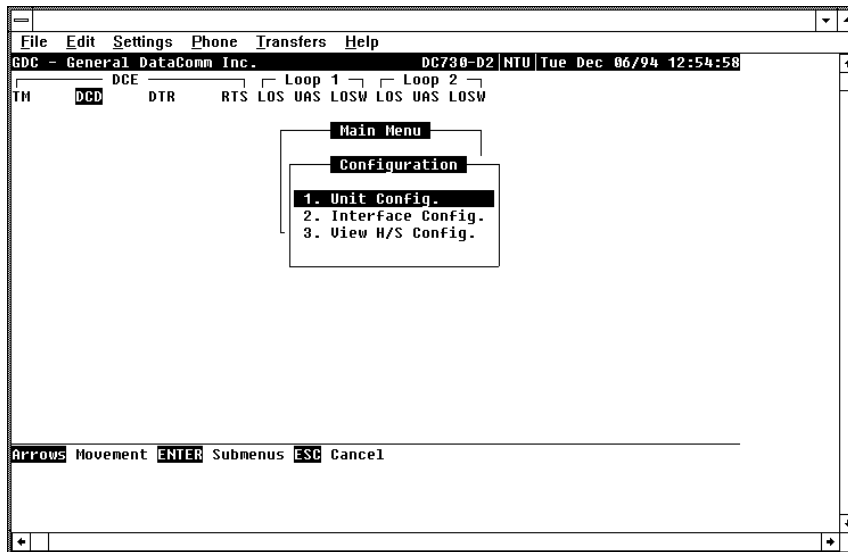
### Operation

To instruct the 730 to stop performing the start-up process, select item 3 from the Diagnostics menu.

## Configuration Menu

Use the Configuration menu to configure the data interface and the HDSL loop parameters.

To open the Configuration menu, select item 2 on the Main Menu. *Figure 3-7* depicts the Configuration menu.



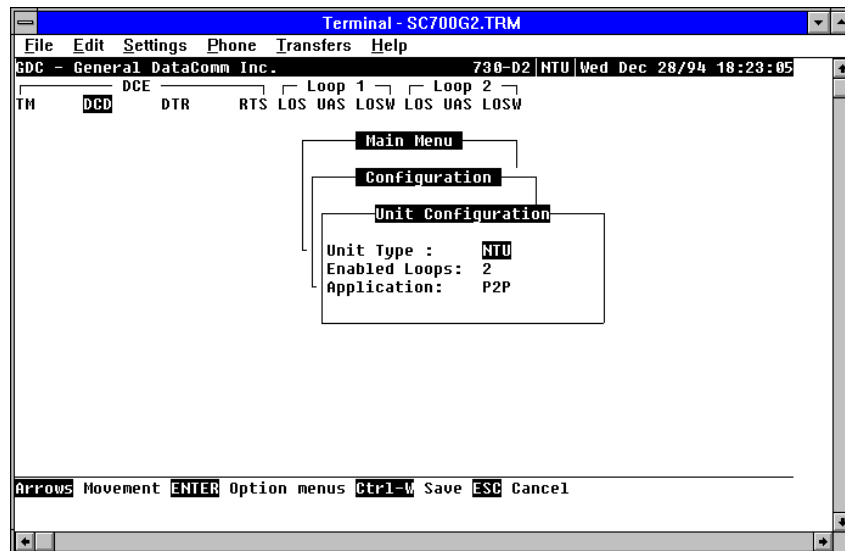
**Figure 3-7** Configuration Menu

The functions available from the Configuration menu are as follows:

- Unit Config.
- Interface Config.
- View H/S Config.

## Unit Configuration Screen

The Unit Configuration option displays the Unit Configuration screen, showing the HDSL configuration parameters of the 730. A typical screen is shown in *Figure 3-8*.



**Figure 3-8** Unit Configuration Screen

The screen includes three fields, which are used to select the operating mode of the 730 on the HDSL loops side, and the network application:

- Unit Type
- Enabled Loops
- Application
- Front Panel Enable

### Operation

1. To display the Unit Configuration screen, select item 1 on the Configuration menu.
2. To change the current value of Unit Type parameter, press Enter. This displays an option menu with the available options:
  - LTU
  - NTU
3. Highlight the desired option and press Enter. The option menu closes and the new selection appears in the screen.
4. The Enabled Loops Field may be edited for the 730-D2 but is fixed at 1 for the 730-D1.
5. The Application field determines whether the unit is being used in Point-to-Point (P2P) or in a Point-to-MultiPoint (P2MP) network configuration. The 730-D1 is intended to be used as a NTU in a P2MP configuration, but may be used as a LTU

- or NTU in a one loop P2P configuration. the 730-D2 is intended to be used as a NTU in a P2P configuration, but may be used as a LTU in a P2P configuration, where the remote unit is another 730-D2.
6. To change the current value of Application, highlight the desired option and press Enter. This displays an option menu with the available options P2P and P2MP.
  7. The Front Panel Enable field determines whether the front panel switches are enabled or disabled.
  8. Highlight the desired option and press Enter. The option menu closes and the new selection appears on the screen.
  9. After making the desired change, press Ctrl W to save the change in the 730. To quit and cancel changes made in this screen, press the Esc key without pressing Ctrl W.
  10. To exit and return to the configuration menu, press the Esc.

### Point-to-Point Options

When the 730-D2 is used in a P2P configuration, any of the three DTE timing options (EXTERNAL, INTERNAL, LOOPED) found in the Interface Config. Screen under TX Clock Mode are available. Usually, when the 730-D2 is configured as a NTU, either the EXTERNAL or LOOPED configuration is used. In this case, the LTU typically is either a 700-G2 or 720-G2 with its E1 Interface Conf. Frame Mode set up for FRAMED. The LTUs E1 DS0s are recombined into a user selectable aggregate data rate (V.35, EIA-530, X.21) by the 730-D2. For increasing 730-G2 aggregate rates, the 730-D2 data is sourced from the E1 DS0s in an increasing order, i.e., 1x64 kbps is sourced from E1 DS0 1, 2x64 kbps is sourced from E1 DS0s 1 and 2, 3x64 kbps is sourced from E1 DS0s 1, 2, and 3, etc. Time slot routing over the HDSL loops follows that shown in *Table 3A*. A maximum aggregate rate of 31x64 kbps is available from the 730-D2 NTU in this case.

Routed E1 timeslots over HDSL loops with 700-G2 Interface Config. TS16 set for DATA

Loop 1	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31
Loop 2	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	f

f = all ones filled

Routed E1 timeslots over HDSL loops with 700-G2 Interface Config. TS16 set for SIGNALING

Loop 1	0	1	3	5	7	9	11	13	15	16	18	20	22	24	26	28	30
Loop 2	0	2	4	6	8	10	12	14	16	17	19	21	23	25	27	29	31

f = all ones filled

**Table 3-A** E1 P2P Timeslot Routing

With two loops enabled in P2P mode, and a 700-G2 LTU with its E1 Interface Config. Frame Mode set for UNFRAMED, an aggregate signal of 2048 kbps may be provisioned. Here, the 730-D2 remote (V.35, EIA-530, or X.21) will have its Tx Clock Mode set for EXTERNAL or LOOPED timing. Additionally, with 730-D2 units as both LTU and NTU, an aggregate nx64 kbps signal up to 2048 kbps may be provisioned. In this case, the 730-D2 LTUs Tx Clock Mode is set for INTERNAL timing, and the 730-D2 NTU's Tx Clock Mode is set for EXTERNAL or LOOPED timing.

With only one loop enabled in P2P mode, and a 700-G2 or 720-G2 LTU with its E1 Interface Config. Frame Mode set for FRAMED, a fractional E1 service may be provided

to the remote site via the 730-D1/D2 NTU. The E1 DS0's are routed over the HDSL loops in a contiguous block as shown in *Table 3A*, and are recombined by the 730-D1/D2 into an aggregate nx64 kbps signal. Up to 18x64 kbps may be provisioned via the 730-D1/D2 in this case. Additionally, with 730-D1/D2 units as both LTU and NTU, an aggregate nx64 kbps signal up to 18x64 kbps may be provisioned in this single HDSL loop configuration. In this case, the 730-D1/D2 LTU's Tx Clock Mode is set for INTERNAL timing, and the 730-D1/D2 NTU's Tx Clock Mode is set for EXTERNAL or LOOPED timing.

**Point-to-MultiPoint Options**

With the 700-G2 or 700-G3 used as a LTU in a P2MP configuration, and with 730-D1 units as remotes (NTU), E1 payload is distributed along the HDSL loops in contiguous blocks of DS0's with the selected blocks of DS0's recombined at the NTU's into an aggregate nx64 kbps signal (V.54, EIA-530, or X.21). In this case, the 730-D1 NTU's Tx Clock Mode must be set for LOOPED timing. Up to 18x64 kbps can be routed to each remote, with the exception that the total data rate of all three remote sites must be less than or equal to 31x64 kbps. A typical configuration is shown in *Table 3B*.

If the 700-G3 Network Configuration Options are set for:

Application	P2MP		
Loop	1	2	3
Start DS0	1	11	20
Consecutive DS0's	10	9	8

Then resulting timeslot routing over the HDSL loops to each 730-D1 is:

Routed E1 timeslots over HDSL loops with 700-G2 Interface Config. TS16 set for SIGNALING

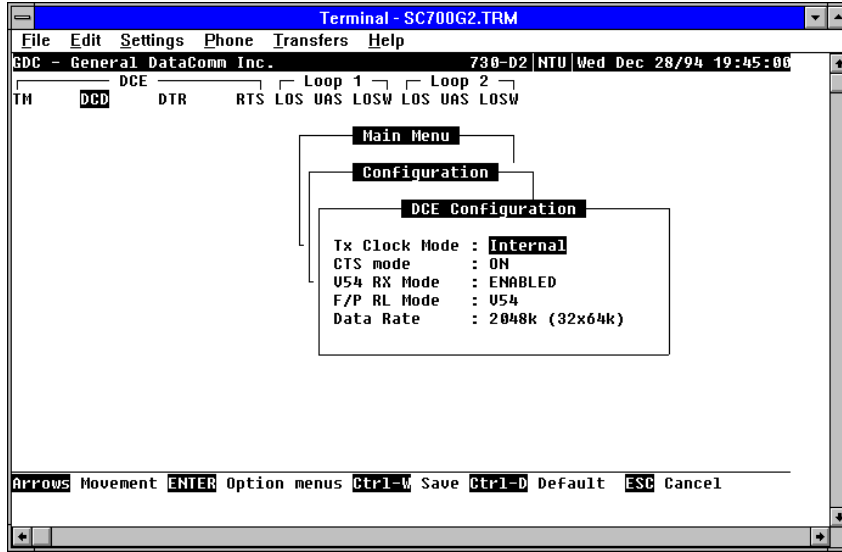
Remote 1	1	2	3	4	5	6	7	8	9	10
	recombined into a 10x64 kbps = 640 kbps V.35, EIA-530, or X21 signal									
Remote 2	11	12	13	14	15	16	17	18	19	
	recombined into a 9x64 kbps = 576 kbps V.35, EIA-530, or X21 signal									
Remote 3	20	21	22	23	24	25	26	27		
	recombined into a 8x64 kbps = 512 kbps V.35, EIA-530, or X21 signal									

**Table 3-B** E1 P2MP Timeslot Routing



## Interface Configuration Screen

The Interface Configuration option displays the DCE Interface Configuration parameters of the 730. A typical screen is shown in *Figure 3-9*.



**Figure 3-9** Interface Configuration Screen

The screen includes the following fields described in *Table 3-5*.

**Table 3-5** Interface Configuration Screen

TX Clock Mode	<p>Displays the DCE interface transmit timing selection:</p> <p><b>Looped</b> - The transmit clock is locked to the receive clock and is developed from the incoming remote end timing.</p> <p><b>External</b> - The DCE interface uses an external clock provided by the customer's DTE.</p> <p><b>Internal</b> - The transmit clock is derived from the internal clock oscillator of the HDSL module.</p>
CTS Mode	<p>ON: CTS is on as long as the HDSL module is powered and operating normally.</p> <p>ON with RTS: The CTS line tracks the state of the RTS line.</p>
V54 Rx Mode	<p>Enabled: The 730 detects and responds to inband V54 protocol.</p> <p>Disabled: The 730 does not respond to inband V54 protocol.</p>
FP RL Mode	<p>V54: Pressing the front panel RL button initiates the V54 protocol toward the HDSL side of the 730.</p> <p>EOC: Pressing the front panel RL button causes the 730 to send a loopback command to the remote HDSL unit.</p>
Data Rate	<p>Press the space bar to increment the data rate, press the minus key to decrement the data rate. Select from N=1 to N=18 for the 730-D1 or N=1 to N=32 for the 730-D2.</p>

## Operation

To display the interface configuration screen, select item 2 on the configuration menu.

To change the current value of a parameter, use the following procedure:

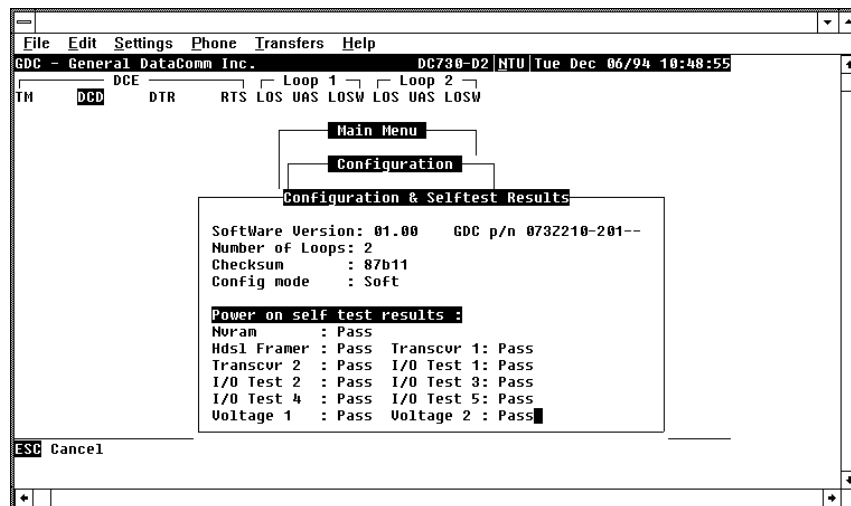
1. Move the selection block to the desired line and press Enter

An option menu appears with the available options.

2. Highlight the desired option, and press Enter. The option menu closes, and the new selection appears in the corresponding line.
3. To reset the selected parameters to the default values, press Ctrl D.
4. To save changes, press Ctrl W.
5. To quit and cancel the changes made in this screen, press Esc.
6. To exit and return to the Configuration menu, press the Esc.

## View H/S Configuration

The View H/S Configuration option displays the Configuration and Selftest Results screen, showing hardware and software configuration data and the results of the last power-up self-test. The information displayed on this screen is intended for maintenance and technical support groups. A typical screen is shown in *Figure 3-10*.



**Figure 3-10** View H/S Configuration Screen

The upper area of the screen presents configuration data. The lower area presents the results of the last power-on self-test. *Table 3-6* describes the fields in the screen.

**Table 3-6** Configuration and Selftest Results Screen Fields

Software Version	Displays the software version of the 730.
Number of Loops	Displays the number of HDSL loops of the 730.
Checksum	Firmware checksum.
Config Mode	Displays the current configuration mode of the 730: <b>Soft</b> - The 730 is configured under software control. <b>Hard</b> - The 730 is configured by means of the internal dip switches and jumpers.

The last power-on self-test results area lists each 730 subsystem tested during the self-test, and the self-test result. Pass or Fail.

## Maintenance Menu

You may refer to *Chapter 4* to perform maintenance and troubleshooting.

## Network Management

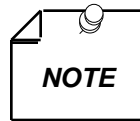
The DataComm 730-D1/D2 can be used as Network Managed elements when used within a GDC Network Management System. The DataComm 730-D1/D2 management software conforms to the MIB (Management Information Base) II standards set out for SNMP Version 1.0. Refer to the related SCM Manager Card publication listed in the *Preface*.

### MIB Tables

This section consists of tables that list and describe the MIB objects by which an SNMP network manager can configure, control, and monitor the DataComm 730-D1/D2. Each table is arranged in five columns:

- MIB Object- name
- Syntax- MIB variable type
- Access- read-write, read-only, or write-only
- Enumeration- interpretation of specific possible values, or range of possible values
- Description - function of the MIB object

The way MIB objects appear on the screen and how they are manipulated varies depending on the network manager or MIB browser being used. The information in these tables is therefore intended for use in conjunction with the operating instructions for manager or browser.



Many SNMP network managers and MIB browsers automatically perform a Get operation immediately following a Set to an object that permits read-write access. In that way the success of the write operation is confirmed. If your manager or browser does not perform this function automatically, it is highly advisable that you command a Get for each object you Set.

**Table 3-7** Version Group Table

MIB Object	Syntax	Access	Enumeration	Description
System MIB Version	Display String	Read-only		Identifies the version of the MIB. The format of the version is x = yzT, where "x" identifies the major revision number, "y" identifies the typographical revision, and "T" identifies the test revision. (not on formal release)  Acceptable values for the individual revision components are: x: 1 - 9 y: 0 - 9 z: 0 - 9 T: A - Z
Version Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable.  SC instance defines the slot, line, drop, and sub-identifier. The table describes the maintenance objects for the unit and references the unit interface..
Firmware Level	Display String	Read-only		The version number of the firmware. This allows the products to know which revision is installed. The released version number is sequenced from , A_...AA...ZZ. Test versions are numerical from 01 to 99.
Model Number	Display String	Read-only		This variable is used to determine the type of card family installed .

**Table 3-8** Maintenance Table

MIB Object	Syntax	Access	Enumeration	Description
Maintenance Line Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable.  SC instance defines the slot, line, drop, and sub-identifier. The table describes the maintenance objects for the unit and references the unit interface..
Soft Reset	SC instance	Read-write	Reset (1) Norm (2)	Supports the action of soft resetting the unit. When this object is set to reset, the unit performs a soft reset to the managed unit. Norm cannot be set by management.
Config Mode	Integer	Read-only	Software (1) Hardware (2)	The hardware configuration mode of the unit. A unit may be hardware or software configured.
System Up Time	Time Ticks	Read-only		This variable is used to report the elapsed system tick time.
Unit Type	Integer	Read-write	LTU (1) NTU (2)	This variable is used to define HDSL type. LTU selects line terminating unit, NTU selects network terminating unit. For 700-G2/G3, this variable can only be a LTU.
Default Initiate	Integer	Read-write	Default (1) Normal(2)	Used to allow the non volatile configuration to be set to a factory default reset. Normal cannot be set by management.
Data Type	Integer	Read-write	Data (2) Voice (1)	Defines the HDSL data type, either data or voice.
Loop Provision	Integer	Read-write	Point-to-point (1) Point-to-MultiPoint (2)	This variable is used to define the HDSL loop provision. When P-P is selected, the unit is connected to another HDSL unit. When P-MP is selected, the unit is connected to more than one HDSL units or data grooming.
Number of Loops Enabled	Integer	Read-write	One Loop (1) Two Loops (2)	Used to define the HDSL loop configuration. It can be set for one to two loops.
Front Panel	Integer	Read-write	Inhibit (1) Enable (2)	Enables or inhibits the front panel operation.
Private Storage 1	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
Private Storage 2	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
Private Storage 3	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.

**Table 3-8** Maintenance Table (Cont.)

MIB Object	Syntax	Access	Enumeration	Description
Data Type	Integer	Read-write	Data (2) Voice (1)	Defines the HDSL data type, either data or voice.
Loop Provision	Integer	Read-write	Point-to-point (1) Point-to-MultiPoint (2)	This variable is used to define the HDSL loop provision. When P-P is selected, the unit is connected to another HDSL unit. When P-MP is selected, the unit is connected to more than one HDSL units or data grooming.
Number of Loops Enabled	Integer	Read-write	One Loop (1) Two Loops (2)	Used to define the HDSL loop configuration. It can be set for one to two loops.
Front Panel	Integer	Read-write	Inhibit (1) Enable (2)	Enables or inhibits the front panel operation.
Private Storage 1	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
Private Storage 2	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
Private Storage 3	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
LED Status	Octet String	Read-only	Octet 1 Bit 7 - not used Bit 6 - not used Bit 5 - not used Bit 4 - not used Bit 3 - NORM E1 Bit 2 - ES E1 Bit 1 - AL Bit 0 - TM Octet 2 Bit 7 - not used Bit 6 - not used Bit 5 - not used Bit 4 - not used Bit 3 - NORM L2 Bit 2 - ES L2 Bit 1 - NORM L1 Bit 0 - ES L1	Returns a bitwise snapshot of the front panel LED status.

**Table 3-9** DTE Configuration Table

MIB Object	Syntax	Access	Enumeration	Description
DTE Config Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop.
DTE CTS Mode	Integer	Read-write	Forced ON (1) ON With RTS (2)	Controls the function of CTS.
DTE Data Rate	Integer	Read-write	(1..32)	This variable represents the DTE data rate in 64 K increments.
DTE TX Clock Source	Integer	Read-write	External Timing (1) Internal Timing (2) Loop Timing (3)	External timing indicates that recovered receive clock from another interface is used as the transmit clock. Internal indicates that a local clock source is used. Loop Timing indicates that the recovered receive clock is used as the transmit clock.

**Table 3-10** HDSL Diagnostic Table

MIB Object	Syntax	Access	Enumeration	Description
Diagnostic Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and sub-identifier, which is in this case, a network interface.
Loopback	Integer	Read-write	No Loopback (1) Line Loop (2) Local Loop (3) Line and Local Loop (4)	Supports the action of a diagnostic loop at the point indicated.
BER Test	Integer	Read-write	Inhibit (1) Enable (2)	Supports the action of bit error rate test. When set to inhibit, no BERT test is in progress. When set to enable, BERT is in progress.

**Table 3-11** HDSL Diagnostic Results Table

MIB Object	Syntax	Access	Enumeration	Description
Diagnostic Results Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and sub-identifier, which is in this case, a network interface.
Test Execution Status	Integer	Read-only	In Sync (1) Not In Sync (2)	The current execution status of the diagnostic test. When set to In Sync, BERT test is in sync and BER rate is valid. When set in NOT IN Sync, BERT test is not in sync, and BER rate is not valid.
	Integer	Read-only	(0..65535)	The results of the last diagnostic test. This can be the current test running or the last completed test.  Note that the interpretation of these test results may be affected by the value of the Test Execution Status object.
Diagnostic Result Interval	Integer	Read-only	(0..65535)	This variable represents the BER test intervals. A time interval is defined as the time required for transmission of a block of bits.



**Table 3-12** HDSL Performance Tables

<b>Current Performance Table</b>				
<b>MIB Object</b>	<b>Syntax</b>	<b>Access</b>	<b>Enumeration</b>	<b>Description</b>
HDSL Current Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which is in this case, can be an E1 or loop interface.
HDSL Current ESs	Gauge	Read-only		The number of errored seconds encountered by an E1 or loop interface in the current 15 interval.
HDSL Current SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop or E1 interface in the current 15 minute interval.
HDSL Current UASs	Gauge	Read-only		The number of degraded seconds encountered by a loop or E1 interface in the current 15 minute interval.
HDSL Current DMs	Gauge	Read-only		The number of degraded minutes encountered by a E1 interface in the current 15 minute interval.
HDSL Current FEBEs	Gauge	Read-only		The number of Far End Block Errors encountered by a loop interface in the current 15 minute interval.
<b>Internal Performance Table</b>				
HDSL Interval Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which is in this case, can be an E1 or loop interface.
HDSL Interval Number	Integer	Read-only	(1..96)	A number between 1 and 96, where 1 is the most recently completed 15 minutes interval and 96 is the least recently completed 15 minutes interval (assuming that all 96 intervals are valid).
HDSL Interval LESs	Gauge	Read-only		The number of erred seconds encountered by a loop or E1 interface in one of the previous 97 individual 15 minute intervals.
HDSL Interval SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop or E1 interface in one of the previous 96 individual 15 minute intervals.
HDSL Interval UASs	Gauge	Read-only		The number of unavailable seconds encountered by a E1 interface in one of the previous 96 individual 15 minute intervals.
HDSL Interval DMs	Gauge	Read-only		The number of degraded minutes encountered by a loop or E1 interface in one of the previous 96 individual 15 minute intervals.
HDSL Interval FEBEs	Gauge	Read-only		This variable represents the HDSL loops Far End Block Errors.

**Table 3-12** HDSL Performance Tables (Cont.)

<b>Total Performance Table</b>				
<b>MIB Object</b>	<b>Syntax</b>	<b>Access</b>	<b>Enumeration</b>	<b>Description</b>
HDSL Total Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which is in this case, can be an E1 or loop interface.
HDSL Total ESs	Gauge	Read-only		The number of errored seconds encountered by an E1 or loop interface in the previous 24 hour interval.
HDSL Total SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop or E1 interface in the previous 24 hour interval.
HDSL Total UASs	Gauge	Read-only		The number of unavailable seconds encountered by a loop or E1 interface in the previous 24 hour interval.
HDSL Total DMs	Gauge	Read-only		The number of degraded minutes encountered by a E1 interface in the previous 24 hour interval.
HDSL Total FEBEs	Gauge	Read-only		The number of Far End Block Errors encountered by a loop interface in the current 15 minute interval.

**Table 3-13** Loop/E1 Performance Interval Maintenance Table

<b>MIB Object</b>	<b>Syntax</b>	<b>Access</b>	<b>Enumeration</b>	<b>Description</b>
HDSL Interval Maintenance Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which is in this case, can be an E1 or loop interface.
HDSL Reset Intervals	Integer	Read-write	Normal (1) Reset (2)	This variable is used to reset loop/E1 performance intervals. When it is set to reset, the loop/E1 performance tables are set to zero.
HDSL Number of Valid Intervals	Integer	Read-only	(1..96)	This variable is used to read the number of intervals collected. Each interval is an increment of 15 minutes.

**Table 3-14** HDSL Status Table

<b>MIB Object</b>	<b>Syntax</b>	<b>Access</b>	<b>Enumeration</b>	<b>Description</b>
HDSL Loop Status Line Index	SC instance	Read-only		This object identifies status parameters associated with the managed object.
HDSL Loop Startup	Integer	Read-write	Normal (1) Start (2) Cancel (3)	Supports the action of initializing HDSL loop startup sequence. When set to start, HDSL unit reinitialize the startup sequence. Set to cancel, the unit aborts the startup sequence. Normal, the unit operates normally.
HDSL Loop Tip and Ring Reversal Mode	Integer	Read-only	Normal (1) Reversed (2)	Signals the loop Tip and Ring status. When normal, the loop operates normally. When reversed, loop Tip and Ring have been reversed.
HDSL Loop Signal to Noise Margin	Integer	Read-only	(0..127)	Represents the loop signal to noise margin in dB units.

**Table 3-14** HDSL Status Table (Cont.)

MIB Object	Syntax	Access	Enumeration	Description
HDSL Loop SN Frac	Integer	Read-only	(0..5)	Used with the HDSL loops signal to noise margin variable in the following manner: 1. Only the values 0 and 5 are allowed. 2. The value of zero means HDSL loops signal to noise margin is a whole number. 3. The value of five means HDSL loop signal to noise margin is a real number and that 0.5 must be added to it.
HDSL Loop SN Atten Sense	Integer	Read-only	Positive (1) Negative (2)	Identifies the sense of the HDSL loop signal to noise margin variable.
HDSL Loop Pulse Atten	Integer	Read-only	(0..100)	Represents twice the HDSL loop pulse attenuation level in dB units.
HDSL Loop Pulse Atten Frac	Integer	Read-only	(0..5)	This variable is used with the HDSL loop pulse attenuation variable under the following conditions: 1. Only the values 0 and 5 are allowed. 2. The value of zero means HDSL loop pulse atten is a whole number. 3. The value of five means HDSL loop pulse atten is a real number and that 0.5 must be added to it.
HDSL Loop Gain	Integer	Read-only	Low (1) High (2) OK (3)	Represents the HDSL loop gain setting.
HDSL Loop Exchange	Integer	Read-only	Normal (1) Exchange (2)	This variable is used to represent the HDSL loop status. When set to normal, HDSL loops are correctly connected. Set to exchange, the HDSL loop has been interchanged.

**Table 3-15** DTE Status Table (DTE Interface Only)

MIB Object	Syntax	Access	Enumeration	Description
DTE Status Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop.
DTE DTR Status	Integer	Read-only	Off (1) On (2)	DTR EIA status indicator.
DTE DCD Status	Integer	Read-only	Off (1) On (2)	DCD EIA status indicator.
DTE RTS Status	Integer	Read-only	Off (1) On (2)	RTS EIA indicator.

**Table 3-16** HDSL Alarm Object Identifier Definitions

Alarm Name	Maskable ?	Applies To
HDSL No Response Alarm	No	Unit
HDSL Diagnostic Rx Error Alarm	No	Unit
HDSL Power Up Alarm	No	Unit
HDSL Unit Failure	No	Unit
HDSL Check Sum Corrupt	No	Unit
HDSL Loss of Signal	Yes	L1, L2
HDSL Unavailable Second	Yes	L1, L2
HDSL Errored Second	Yes	L1, L2
HDSL Loss of Sync Word	Yes	L1, L2



# 4 Tests

## Overview

This chapter is divided into the following main paragraphs: Loopback testing hard and soft, troubleshooting procedures, and the Maintenance Menu screens and descriptions.

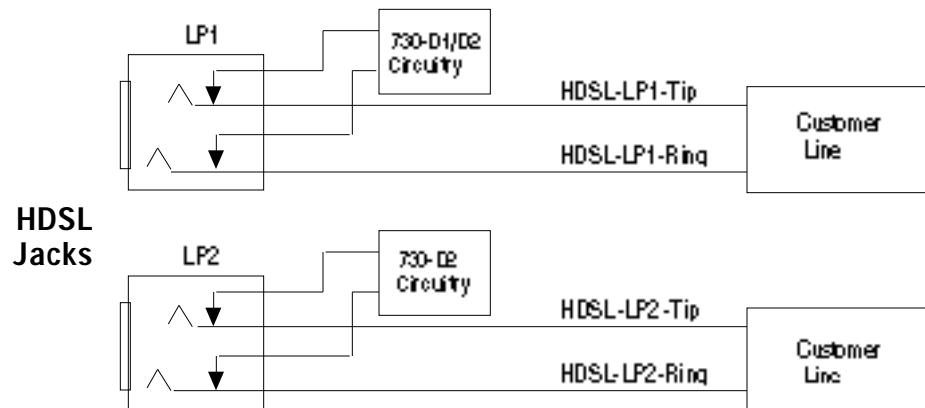


*The activation of any loopback disrupts the flow of user's traffic.*

The 730 displays the status of these tests through the indicators on the front panel. You may also use the optional terminal connected to the control port (CTRL) on the front panel which provides a comprehensive set of features for testing operation and identifying trouble areas. This chapter provides instructions for managing the 730 system with this terminal and tells you how to enable and disable various loopbacks.

## Metallic Testing

The 730 provides front panel bantam jacks for customer use in testing the HDSL lines and circuitry. The break-in points of these jacks are shown below:

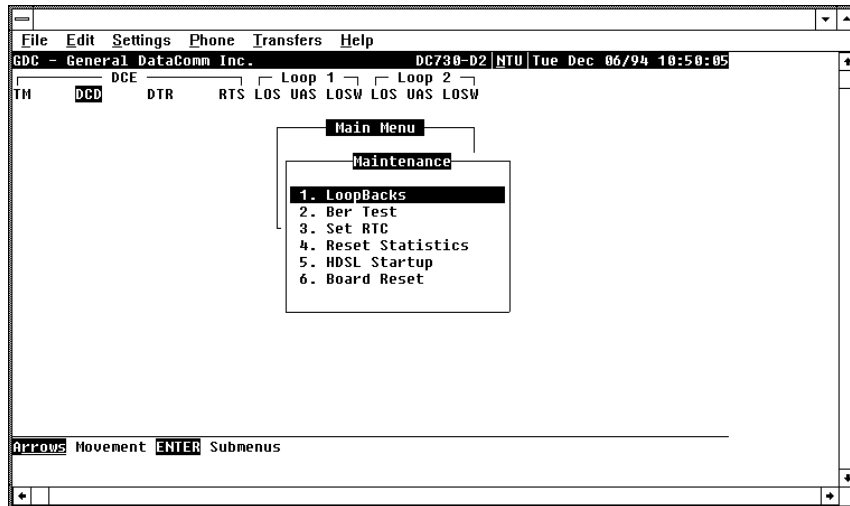


## Troubleshooting Procedures

- LEDs are OFF:
  1. If all the LEDs are OFF, verify that the fuse on the rear panel is good.
  2. If the terminal is working, check the status of voltage 1, voltage 2 on the terminal's View H/S Config screen. If there is a problem send for repair.
- Start Up Continuously Fails:
  1. If an HDSL red ES LED is continuously ON during start-up, the card is not receiving a signal from the far end of its channel. Check the loop connections between the two cards (LTU and NTU).
  2. Verify that one card is configured as LTU and the other as NTU.
  3. Verify that the HDSL receiver gain (X11, X19) on each loop is the same as reported on the terminal screen.
  4. Check the status of the card in the View H/S Config screen.

## Maintenance Menu

The Maintenance Menu is used to perform maintenance and troubleshooting activities. To open the maintenance menu, select item 3 on the main menu. *Figure 4-1* illustrates the Maintenance Menu.



**Figure 4-1** Maintenance Menu

The functions available from the maintenance menu are as follows:

- Loopbacks
- BER Test
- Set RTC
- Reset Statistics
- HDSL Startup
- Board Reset

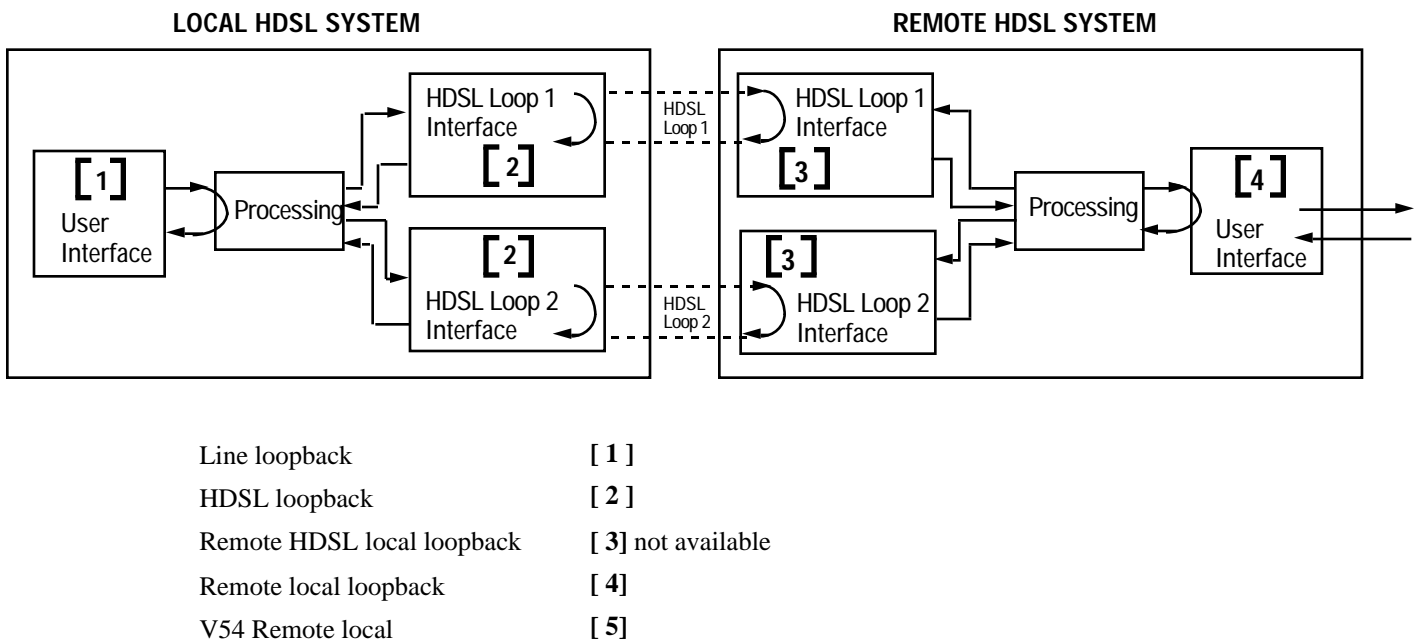


## Loopback Testing



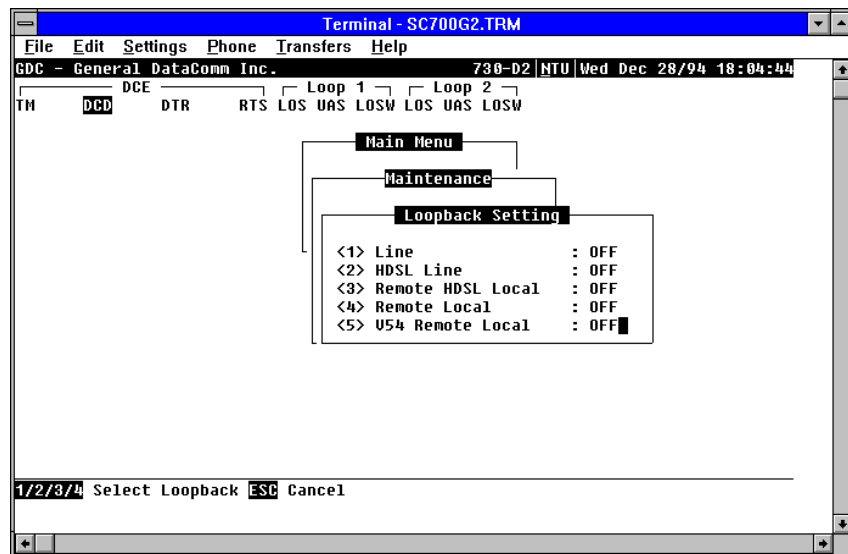
*The activation of any loopback disrupts the flow of user's traffic.*

This function is used to enable/disable loopbacks on the user's equipment interface and on the HDSL loops for maintenance purposes. The HDSL systems offered by GDC provide three types of test loopbacks. *Figure 4-2* shows the simplified signal paths when the loopbacks are connected.



**Figure 4-2** Loopbacks Signal Paths

Figure 4-3 shows a typical loopback setting screen for a HDSL system using a DTE interface.



**Figure 4-3** Loopback Screen

### Operation

To access the Loopbacks function, select item 1 on the Maintenance Menu.

To change the state of a loopback, use the following procedure:

1. Type the number of the line of the desired loopback. This toggles the selected loopback ON and OFF.
2. Highlight the desired option, and press Enter to send the command to the HDSL system. The option menu closes, and the new selection appears in the corresponding line.
3. To exit and return to the Maintenance Menu, press the Esc.

### Loopback Testing (Hard)

The 730 supports two types of loopbacks at the front panel:

LL - Line Loopback loops the data back towards the user's equipment interface. The unit must be configured for external timing for this loopback to be functional.

RL - Remote Loopback signals the remote unit to loopback the data at its user's equipment interface. There are two types of remote loopbacks depending on the front panel RL configuration (see Configuration screen). One is EOC remote local loopback which sends loopback information over the EOC channel. The other is V.54 remote local loopback which sends an inband V.54 loopback code signaling the remote circuit into loopback.

The forward signal for both of these loopbacks is transparent.

## Loopback Testing (Soft)

You may also use the optional terminal connected to the Control Port (CTRL) on the front panel which provides a comprehensive set of features for testing operation and identifying trouble areas. You may use loopbacks to enable/disable loopbacks on the user's equipment interface and on the HDSL loops, for maintenance purposes.

The HDSL systems offered by GDC provide three types of test loopbacks available from the optional terminal. *Figure 4-2* shows the simplified signal paths when the loopbacks are connected.

### Line Loopback

The line loopback is generally used to test the connections between the local user's equipment and the HDSL system module.

When the local line loopback is connected (ON) (loopback [ 1 ]), the data signal received from the local user via the transmit line of the user's equipment interface is returned by the HDSL system module on the receive line of that interface. Therefore, during normal operation the local user's equipment should receive its own signal without errors.

The local user transmit signal is transparent and therefore is sent to the remote HDSL system, however the signal received from the remote HDSL system is lost.

### HDSL Line Loopback

The HDSL loopback is generally used to test the proper operation of the HDSL system, and therefore should be used after normal operation is obtained.

When the HDSL loopback is connected (ON) (loopback [ 2 ]), the transmit signal of each HDSL loop is returned by the HDSL loop interface (s) of this HDSL system module on the receive path of the same loop. Therefore during normal operation the local user's equipment should receive its own signal without errors.

The local user transmit signal is transparent and therefore sent to the remote HDSL system, however the signal received from the remote HDSL system is lost.

### Remote HDSL Local Loopback - Not Available.

### Remote Local Loopback

The remote local loopback is generally used to test end-to-end the proper operation of the HDSL link, and therefore should be initiated by the LTU only and used after normal operation is obtained.

When the EOC remote line loopback is connected (ON) (loopback [ 3 ]), the data received by the remote module from the local user is returned by the HDSL system module on the receive path, within the remote user's equipment interface. Therefore, during normal operation the local user's equipment should receive its own signal without errors.

The local user transmit signal is also passed to the remote user's equipment connected to the HDSL system, however the signal transmitted by the remote user is lost.

### V.54 Remote Loopback

The V.54 remote loopback is generally used to test the proper operation of one remote to another. You should use it after normal operation is obtained. When the V.54 loopback is selected (loopback 5), the initiating unit sends V.54 inband code to the other remote unit. Upon receiving an acknowledgment the initiating unit turns its TM LED ON indicating the far-end unit is in the loopback mode.

When the loopback is engaged, you will see error -free data returning. The other remote units data will be blocked.

In the case when the other unit doesn't acknowledge the V.54 inband loopback code, or error to transmit the acknowledgment, the initiating unit continues sending V.54 inband code and blocks data until there is a correct acknowledgment, or the loopback command is terminated.

## Considerations in the Use of Test Loopbacks

The test loopbacks are designed to allow systematic testing of the signal paths along the link, starting from one end of the link (the "local" HDSL module). In most situations, it is recommended to initiate the loopbacks from the side serving as the LTU, because this would allow you to follow the signal path starting from the office and continue toward the end user in addition to maintaining system timing. All of the test loopbacks are transparent.

The recommended order of test activation is as follows:

1. Line loopback.
2. HDSL line loopback.
3. Remote local loopback
4. V54 remote local loopback.

This is also the order in which the loopbacks are listed on the LOOPBACKS screen.

## BER Test

This screen is used to perform bit error measurements on an HDSL system module.

### Testing Method

BER testing is performed by repeatedly transmitting a pseudo test sequence having a length of  $2^{15}-1$  bits, and comparing by means of an error detector the received sequence. Any difference is assumed to be an error and is counted. To perform a meaningful comparison, the error counting is inhibited until the error detector becomes synchronized to the incoming sequence. During this synchronization, it is possible to see a burst of 255 errors.

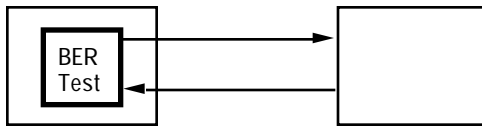
During this testing, your traffic is disconnected. BER tests may be performed in an end-to-end mode that requires both LTU and NTU BER testers to be on. If testing is initiated at one end, a loopback along the signal path needs to be connected. The loopback can be a physical connection made somewhere along the signal path or a test loopback activated at the desired location as described in the Loopbacks paragraphs of this manual. Alternatively, an external BERT may be connected to the remote unit to facilitate testing.

The measurement is carried out over discrete intervals (an interval corresponds to the time required for a transmission block of  $2^{24}$  bits). The number of errors that are counted in each interval can be up to 255. If the actual number of errors in a given interval is higher, this maximum count is considered in the calculation of the BER. The calculated BER is updated at the end of each interval.

The bit error rate test can be performed over individual HDSL loops or over the entire HDSL bandwidth. (Only one BERT test can be active at a time). For the point-to-point mode of operation, the BER test can only be performed over all the loops. For point-to-multipoint, you can perform the BERT test on individual loops.

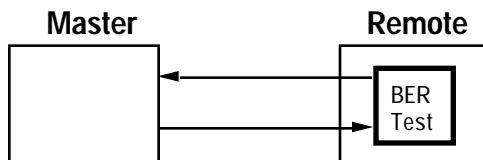
BER testing can be performed through the GDC UAS Controller, supervisory terminal port or front panel switch. The front panel LED TM is on when the BER test is initiated. When the error detection is in sync and detects no errors, the TM LED is solid on. However, when the error detector is not in sync or detects some errors, the TM blinks.

## Test Configuration Notes



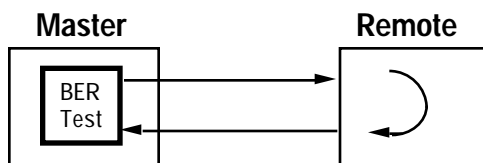
### Master Self-Test:

Enable Master BER test. Be sure you have an external loopback or test equipment at the remote unit to facilitate this test.



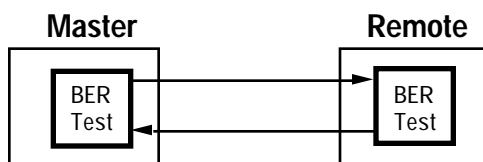
### Remote Self-Test:

Enable BER test on remote unit. Be sure you have an external loopback or test equipment at the master unit to facilitate this test.



### Self-Test with Remote Loopback:

From Master unit, assert Remote Loopback (RL) and enable BER test.



### Master to Remote Self-Test:

Enable BER test on both Master and Remote unit.

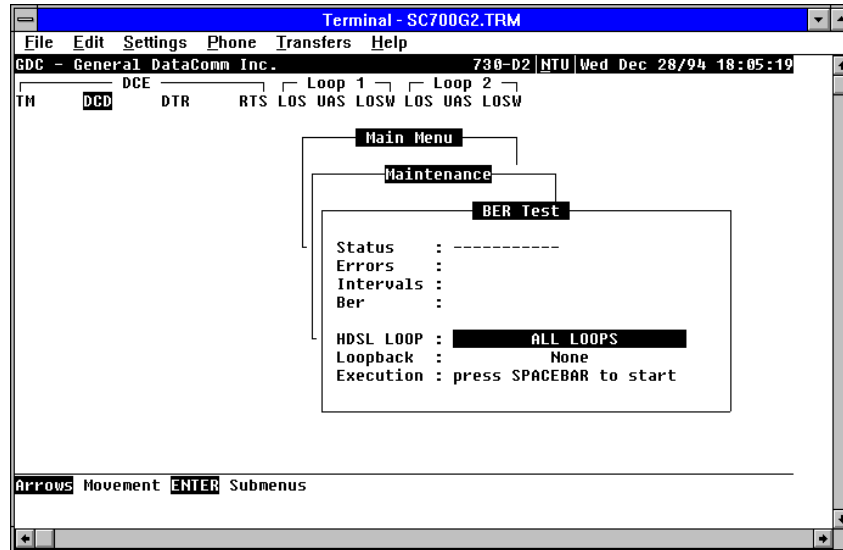


### Remote Self-Test with V.54 RDL:

Place far-end remote into Remote Loopback by sending V.54 code and turn on the self-test on that remote. This test can only be initiated from the front panel or supervisory terminal. Both remote units must be 730 units.

## BER Screen Description

A typical screen for BER testing is shown in *Figure 4-4*.



**Figure 4-4** BER Test Screen

The dialog box used to control BER testing has two areas:

- The top area is used to display BER results.
- The bottom area is used to select the desired HDSL loop you want to perform the test on, and to start/stop BER measurement.

The fields of the BER Test dialog box are described in *Table 4-2*.

**Table 4-2** BER Test Screen Fields

Status	Displays the current status of the error detector: Sync - The error detector is synchronized, and the BER measurement is possible. Out-of-Sync - The error detector is not synchronized, and BER measurement is inhibited.
Intervals	Displays the number of measurement intervals up to this point.
BER	Displays the BER calculated up to this point.
Loopback	Displays the current state of the loopback activated for the purpose of the BER test: No loopback has been activated. In this case, an external loopback, e.g., a physical loopback connection, must be connected before starting the BER test. Remote Local - Remote line loopback is activated for the BER test.
Execution	Displays the next state of BER measurement: Press SPACEBAR to start - BER measurement disabled. Press SPACEBAR to stop - BER measurement enabled.

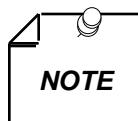
### Operation

1. To display the BER TEST screen, select item 2 on the Maintenance Menu.
2. Select desired HDSL loop you want to perform test on, by moving the selection block to HDSL loop field. Press the spacebar to select the desired HDSL loop.
3. Make sure a loopback is activated. If the Loopback field displays None and no external loopback is currently connected, change the state of the loopback used for BER measurement. Move the selection block to the Loopback line and press the spacebar.

To enable/disable BER testing:

1. To start the BER measurement, move the selection block to the Execution field and press the space bar. The Execution field now shows Stop.
2. To stop the BER measurement, move the selection block to the Execution line and press the space bar. The Execution field now shows Press SPACEBAR to start.

To exit and return to the maintenance menu, make sure that BER testing has been disabled, and press the **ESC** key.



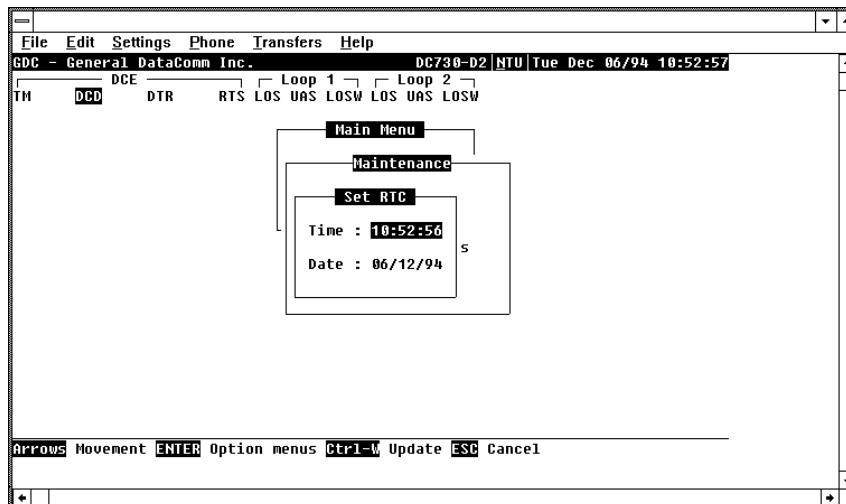
*You cannot exit the BER TEST screen while a BER test is running.*

*When you start or stop the BER test on one of the HDSL loops, the other loop(s) see bursted errors on its data.*

*The BER test detector will synchronize and show error-free for all 1s and all 0s pattern.*

## Set RTC

The Set RTC option enables you to set the real-time clock of the 730. A typical screen is shown in *Figure 4-5*.



**Figure 4-5** Set RTC Screen

The screen includes two fields described in *Table 4-3*.

**Table 4-3** Set RTC Screen Fields

Time	Displays the time in 24-hr military format showing hours:minutes:seconds retrieved from the 730 at the time the screen is opened.
Date	Displays the date (day/month/year) retrieved from the 730 at the time the screen is opened.

### Operation

To change the current time or date, use the following procedure:

1. Move the selection block to the desired line and press Enter.
2. Type the new time or date in the format seen on the screen, then press Enter. The option menu closes, and the new time and/or date appears in the corresponding line.
3. To save changes, press Ctrl W.
4. To quit and cancel the changes made in this screen, press Esc without pressing Ctrl W.
5. To exit and return to the maintenance menu, press the Esc.



*The 730 internal time is updated at the instant you press CTRL W.*

## Reset Statistic

The Reset Statistics option resets all the performance statistics entries of the 730.

### Operation

To instruct the 730 to reset all the performance statistics counters:

1. Select item 4 on the Maintenance Menu. You will see a dialog box with two options: Yes and No.
2. To reset the statistics, move the selection block to Yes , and press Enter.
3. To exit without resetting press Esc, or move the selection block to No, and press Enter.

## HDSL Start-Up

This option is used to initiate manually the 730 HDSL loops start-up process: Normally this process is automatically performed upon link initialization and whenever the synchronization between two linked 730 units is lost.



*The activation of this function will disrupt the transfer of data through the link for a short time.*



To instruct the 730 to perform the start-up process, select item 5 on the Maintenance Menu.

## Board Reset

This option is used to reset the 730.

To reset the 730, select item 6 on the Maintenance Menu. After a few seconds, the opening screen will appear. The unit performs the start-up process, and displays the Main Menu screen.



*The activation of this function will disrupt the transfer of data through the link for a short time.*

# 5 Application Guide

## Overview

This chapter includes timing notes and typical applications to assist you in configuring your system.

## Timing Options

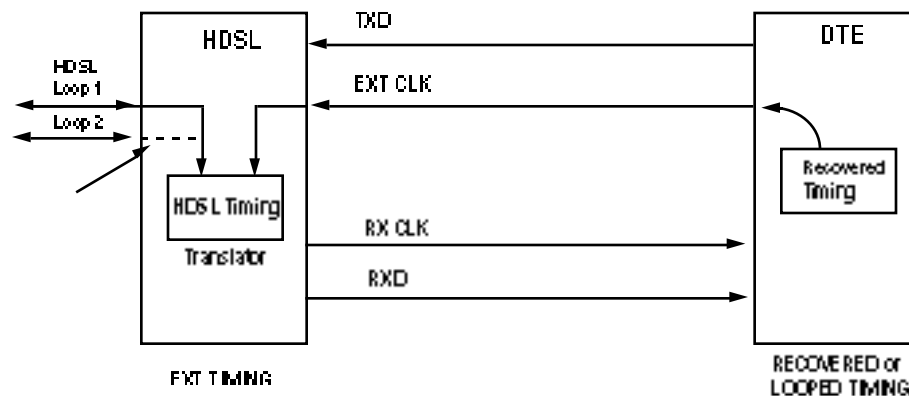
### High Channel Data Rate Application

The length of the cable connecting the customer equipment (the DTE) to the 730 is an important factor when using DCE timing in a high channel data rate application. (With DCE timing, the 730 provides timing to the DTE. The DCE timing options in the 730 include Looped Timing and Internal Timing.) The cable creates a delay between the 730s clock and data arriving from the DTE. When this delay is too great (because the cable is too long or the rate is too high), it can cause errors.

If errors occur with DCE timing, you can use External Timing for the 730 and loop timing for the DTE. This permits operation at any data rate, regardless of cable length. (Note that the ITU-T V.35 recommendation limits cable length to about 30 m.) Refer to *Figure 5-1* and the *Chapter 3 - Operation* for configuring timing options.



*Select the appropriate timing option for the DTE: The DTE must loop timing from the Chnl Rcv Clk lead to the Chnl Ext Clk lead..*

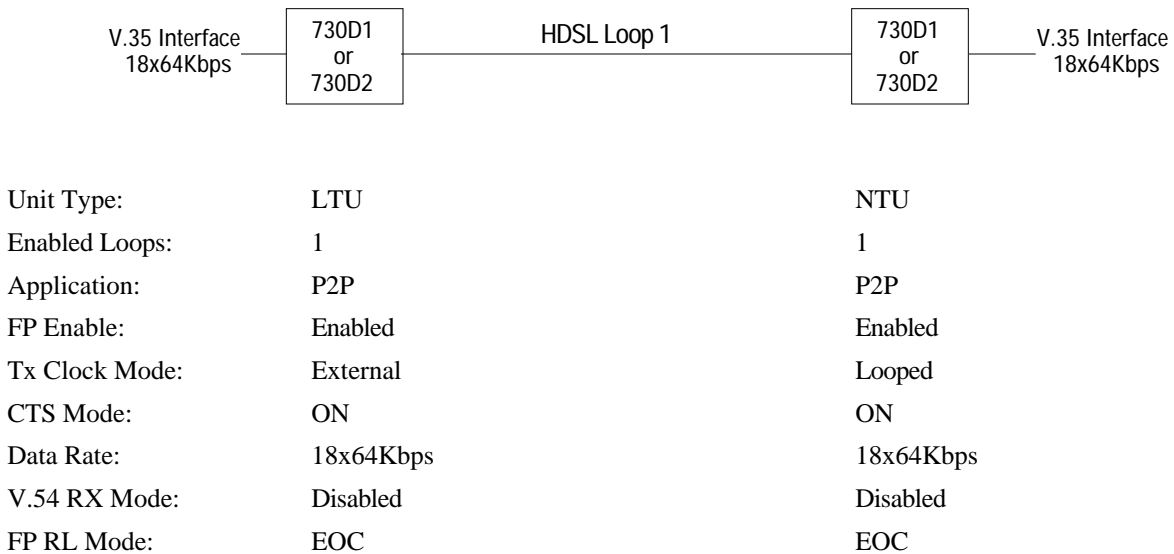


**Figure 5-1.** High Channel Data Rate Application

## Typical Applications

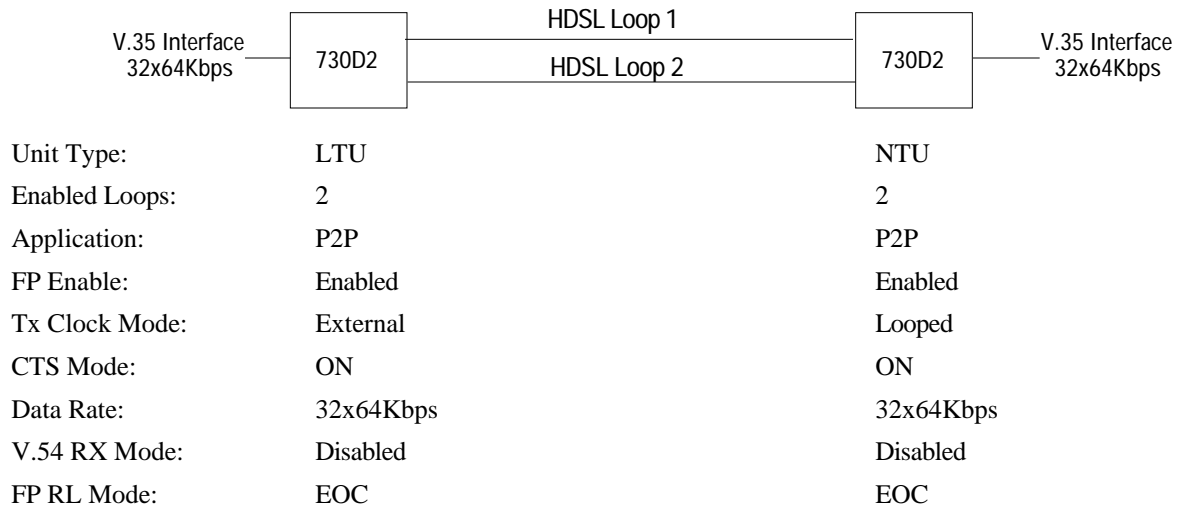
Figures 5-2 through 5-6 show typical applications and option settings for configuring your system.

### Single Loop Point-to-Point



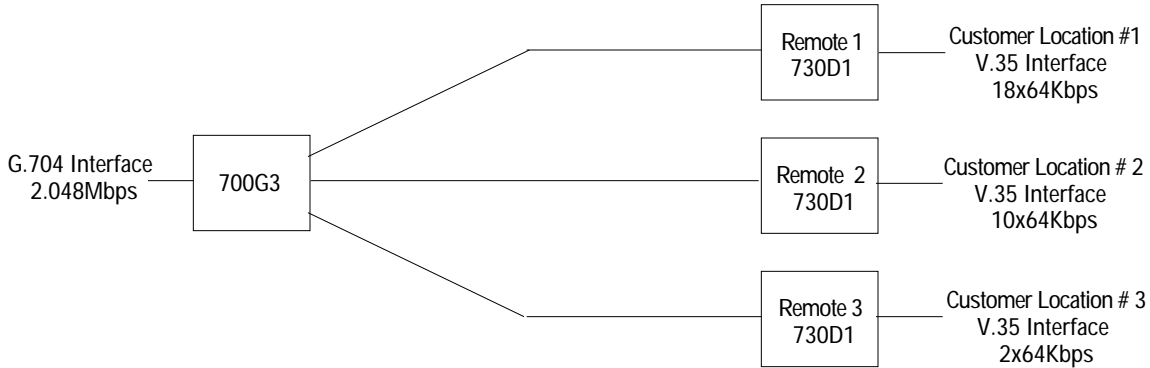
**Figure 5-2.** Single Loop Point-To-Point Application

## Two Loop Point-to-Point



**Figure 5-3.** Two Loop Point-to-Point Application

### Point-to-MultiPoint Data Grooming



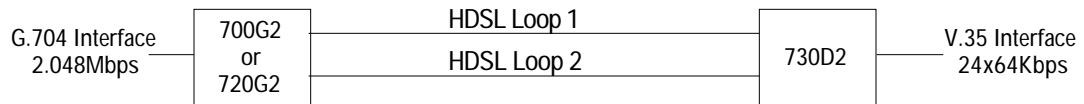
		<b>Remote 1</b>	<b>Remote 2</b>	<b>Remote 3</b>
Unit Type:	LTU	Unit Type:	NTU	NTU
Enabled Loops:	3	Enabled Loops:	1	1
FP Enable:	Enabled	Application:	P2MP	P2MP
Line Unit:	TLU	FP Enable:	Enabled	Enabled
Line Code:	HDB3	Tx Clock Mode:	Looped	Looped
Frame Mode:	Framed	CTS Mode:	ON	ON
TS16:	Data	Data Rate:	18x64Kbps	10x64Kbps
		V.54 Rx Mode:	Enabled	Enabled
		FP RL Mode:	V.54	V.54

**Network Configuration**

Application:	P2MP
Loop 1 Start DS0:	1
Loop 1 Consecutive DS0:	18
Loop 2 Start DS0:	19
Loop 2 Consecutive DS0:	10
Loop 3 Start DS0:	29
Loop 3 Consecutive DS0:	2

**Figure 5-4.** Point-to-Point MultiPoint Data Grooming Application

## Fractional G.704 Service (2 Loop)



Unit Type: LTU  
 Enabled Loops: 2  
 FP Enable: Enable  
 Line Unit: TLU  
 Line Code: HDB3  
 Frame Mode: Framed  
 TS16: Data

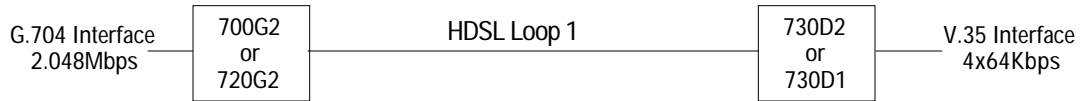
Unit Type: NTU  
 Enabled Loops: 2  
 Application: P2P  
 FP Enable: Enabled  
 Tx Clock Mode: Looped  
 CTS Mode: ON  
 Data Rate: 24x64Kbps  
 V.54 Rx Mode: Enabled  
 FP RL Mode: V.54

### Network Configuration

Application: P2P  
 Loop 1 Start DS0: Not Applicable  
 Loop 1 Consecutive DS0: Not Applicable  
 Loop 2 Start DS0: Not Applicable  
 Loop 2 Consecutive DS0: Not Applicable

**Figure 5-5.** Fractional G.704 Service (2 Loop) Application

## Fractional G.704 Service (1 Loop)



Unit Type: LTU  
 Enabled Loops: 1  
 FP Enable: Enable  
 Line Unit: TLU  
 Line Code: HDB3  
 Frame Mode: Framed

Unit Type: NTU  
 Enabled Loops: 1  
 Application: P2P  
 FP Enable: Enabled  
 Tx Clock Mode: Looped  
 CTS Mode: ON  
 Data Rate: 4x64Kbps  
 V.54 Rx Mode: Enabled  
 FP RL Mode: V.54

### Network Configuration

Application: P2P  
 Loop 1 Start DS0: 1  
 Loop 1 Consecutive DS0: 4

**Figure 5-6.** Fractional G.704 Service (1 Loop) Application

# A Technical Characteristics

---

<b>Local Side</b>	
Rate	N x 64 N = 1 to 32
Interface	V.35 [optional X.21 or V.11 (530)]
<b>Remote Side</b>	
Rate	Dual duplex 584 Kbaud signaling rate, with 2B1Q line code (each loop)
Framing	HDSL framing per ETSI ETR, including performance monitoring via the embedded operation channel (EOC)
Interface	One or two non-loaded DLL - loops
Transmit Power	13.5 dBm ( $\pm$ 0.5 dB)
<b>Transmission Line</b>	
<p>Two metallic twisted-pairs (loop # 1 and loop # 2), non-loaded DLL type, up to 3.2 Km at 0.4 mm or up to 4.5 Km at 0.5 mm under the following conditions:</p> <p>No loading coils, no additional shielding.</p> <p>When Bridged-Taps (BTs) are present, the following rules apply:</p> <p>Maximum number of bridged-taps = 2</p> <p>Maximum tap length = 1000 meters</p> <p>No loop impairments</p> <p>Meets performance specification of ETSI DTR/TM 3017</p>	
<b>Test Features</b>	
Local Loopback	Front panel switch or terminal screen selectable.
Remote Loopback	Front panel switch or terminal screen selectable.
BER Test	Front panel switch or terminal screen selectable.
V.54 Protocol	Front panel switch or terminal screen selectable.



## Technical Characteristics (Cont.)

<b>Dimensions</b>	
<b>Standalone</b>	
Height	99 mm (3.9 in.)
Width	277 mm (10.9 in.)
Depth	318 mm (12.5 in.)
Weight	3.2 kg (7.1 lbs.)
Shipping Weight	3.6 kg (8.1 lbs.)
Temperature	0° to 50°C (32° to 122°F) operating -40° to 70°C (-40° to 158°F) non-operating
<b>Rackmount (Full shelf with 16 units)</b>	
Height	267 mm (10.5 in.)
Width	484 mm (19.0 in.)
Depth	343 mm (13.5 in.) Also, 305 mm (12.0 in.) in DS-6 Enclosure.
Weight	18 kg (40.2 lbs.)
Shipping Weight	19 kg (42.5 lbs.)
Temperature	0° to 50°C (32° to 122°F) operating -40° to 85°C (-40° to 185°F) non-operating
Fusing	F1, F2: 2A, 250V, FB
Safety Protection	UL listed and CSA approved
<b>Electrical</b>	
Power	7 watts per card at card edge.
<b>Environmental</b>	
Temperature Card Assembly Operation Card Assembly Storage/ Non-Operating	0 to 50 degrees Celsius -40 to +85 degrees Celsius
Humidity	5 to 95% non-condensing
Altitude Operating Non-Operating	0 to 10,000 feet 0 to 40,000 feet

# B Business Equipment (DTE) Interface Signals

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## EIA/TIA-232-E and ITU-T

P1 Pin	V.35 Pin	ITU-T (See Note)	EIA	Signal	Description
1	A	101	AA	Protective ground	This circuit is connected to the equipment frame. Normally, it is separated from signal ground (pin B) by 100 ohms, but it may be connected to signal ground by means of an option strap.
7	B	102	AB	Signal ground	Establishes a common ground reference for all interface circuits except protective ground, pin A.
4	C	105	CA	Request-to-send	Indicates to 730 that DTE is prepared to transmit.
5	D	106	CB	Clear-to-send	Indicates to DTE that 730 is prepared to transmit.
6	E	107	CC	Data-set-ready	Indicates to DTE that 730 is operational.
8	F	109	CF	Received line signal detector	Indicates to DTE that 730 is receiving data (not idle or OOS codes).
25	K	142	TM	Test mode	Indicates to DTE that 730 in a test mode.
18	L	141	LL	Line loopback enable	Transfers signal from DTE to control Line Loopback test mode.
2 14	P S	103 103	BA(A) BA(B)	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications line.
3 16	R T	104 104	BB(A) BB(B)	Received data	Transfers data signals received over communication line and demodulated by 730 to DTE.
12 24	U W	113 113	DA(A) DA(B)	Transmitter timing (DTE source)	Transfers transmitter signal timing information from DTE to 730.
13 17	V X	115 115	DD(A) DD(B)	Receiver timing	Transfers receiver signal timing information from 730 to DTE.
19 15	Y AA	114 114	DB(A) DB(B)	Transmitter timing	Transfers transmitter signal timing information from 730 to DTE.

## EIA/TIA-232-E and ITU-T (Cont.)

<b>P1 Pin</b>	<b>V.35 Pin</b>	<b>ITU-T (See Note)</b>	<b>EIA</b>	<b>Signal</b>	<b>Description</b>
21	BB/b	140	RL	Remote Digital Loopback test enable	Transfers signal from DTE to control Remote Digital Loopback test mode.
20	H	108/2	CD	Data Terminal Ready	Indicates to 730 that DTE is prepared for data communication.
9				+12V	Provided to Interface
10				-12V	Provided to Interface
NOTE: ITU-T designations are shown for reference only. M, N, CC, FF, HH, JJ, KK, LL, MM, NN, Z, and pins 23, 26 are not used.					

**EIA-530**

<b>Pin</b>	<b>Circuit</b>	<b>Direction</b>	<b>Description</b>
1			Frame Ground
2	BA	To 730	Send Data (A)
14	BA	To 730	Send Data (B)
3	BB	From 730	RCV Data (A)
16	BB	From 730	RCV Data (B)
4	CA	To 730	RTS (A)
19	CA	To 730	RTS (B)
5	CB	From 730	CTS (A)
13	CB	From 730	CTS (B)
6	CC	From 730	DSR (A)
22	CC	From 730	DSR (B)
7	AB		Signal Ground
8	CF	From 730	DCD (A)
10	CF	From 730	DCD (B)
17	DD	From 730	RCV CLK (A)
9	DD	From 730	RCV CLK (B)
24	DA	To 730	EXT CLK (A)
11	DA	To 730	EXT CLK (B)
15	DB	From 730	TX CLK (A)
12	DB	From 730	TX CLK (B)
20	CD	To 730	DTR (A)
23	CD	To 730	DTR (B)
21	RL	To 730	Remote Digital Loopback Enable
18	LL	To 730	Line Loopback Enable
25	TM	From 730	Test Mode

## X.21

P1/P2 Pin	* 15-Pin X.21 Connector	ITU-T Circuit	Signal	Description
2 14	2 9	T(A) T(B)	Transmitted Data	Data from DTE.
3 16	4 11	R(A) R(B)	Received Data	Data to DTE.
4 19	3 10	C(A) C(B)	Control	Indicates to 730 that DTE is prepared to transmit.
8 10	5 12	I(A) I(B)	Indication	Indicates to DTE that 730 is receiving data.
17 9	6 13	S(A) S(B)	Signal Element Timing	Transmit and receive signal timing information from 730 to DTE.
24 12	7 14	X(A) X(B)	* DTE Signal Element Timing (X)	Optional transmit signal timing information from DTE to 730 if X.21 adapter module is configured for XT.
7	8	G	Signal Ground	Common ground reference.
* Optional transmit signal timing, X.21 Interface Card jumper position BT, (Byte Timing) is not supported.				

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**General DataComm**